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BIOCHEMISTRY OF CANCER WITH REFERENCE TO CHEMOTHERAPY

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THE BIOCHEMICAL PROPERTIES of malignant neoplastic tissues have assumed an increasing importance in relation to cancer chemotherapy. This is attested to by the books, symposia, and reviews on various aspects of the problem (31, 32, 42, 43, 47, 57, 93, 95). It is self-evident that the goal of such endeavors is the elucidation of a chemical representation of the biologic behavior of cancer tissue, since such information would expand our understanding of the disease. Furthermore, the demonstration of a unique or even relatively unique chemical characteristic of cancer tissue might provide the basis for the development of a rational chemotherapy of the disease (8, 85, 88).

Although we still lack critical information, much has been learned about the biochemical behavior of cancer tissue and the tumor host which bears directly on the problem of cancer chemotherapy. These data, while fundamentally interrelated, may be grouped into the following divisions: (a) energetic mechanisms, (b) synthesis of nucleoprotein, and (c) tumor host interrelationships. It is obvious that such a grouping represents an arbitrary selection from multitudinous lines of investigation. It is felt, however, that much of the enigma of the behavior of cancer is connected with these phases of the problem and thus special consideration of them would not be amiss at this time.

Energetic mechanisms. The liberation of energy from substrates for the performance of biological work is accomplished by highly specialized enzyme systems. They make possible complex oxidative reactions of two main types: fermentation (glycolysis) and respiration. It should be noted that fermentation is associated with oxidation-reduction reactions which take place without the intermediation of oxygen and yield lactic acid as an end product. In this connection it is of interest that more than 25 years ago Warburg called attention to the fact that cancer tissue metabolism is characterized by the production of relatively large amounts of lactic acid as compared to control tissues (102). In essence, cancer tissue tends to exhibit a high rate of glycolysis. In cancer tissues such glycolytic or fermentative reactions occur both anaerobically and aerobically. The latter phenomenon (aerobic glycolysis) is an unusual occurrence in control tissues since glycolysis is typically inhibited by oxygen (Pasteur

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effect) and respiration supervenes, which results in the production of the familiar metabolic end products, carbon dioxide and water.

This form of physiological oxidation involves the participation of redox enzymes which function in a sequential relationship dictated by the thermodynamic properties of the component enzymes, viz., dehydrogenase, coenzyme, flavoprotein, cytochrome, and cytochrome oxidase. These agents act as hydrogen and electron acceptors and make possible the dehydrogenation of the substrate (oxidation) and the ultimate transport of the electron to molecular oxygen (reduction) to create oxygen ions which form water upon combination with the hydrogen ions of the acid base continuum of the cell.

In view of the importance of such reactions in the energetics of most normal tissues it is of interest that cancer tissues are characterized by a lower content of cytochrome and cytochrome oxidase than is found in homologous control tissues. It should be emphasized, however, that this activity is not absent in cancer tissue but appears to be at a marginal level in relation to the metabolic activity of the neoplasm (7, 47, 59, 80, 82, 103, 104).

As mentioned, in addition to water the second characteristic end product of respiration is carbon dioxide. This is produced from trioses in the cyclic condensation and degradation reactions known as the tricarboxylic acid cycle or cyclophorase system. Of particular interest is the observation that the cyclophorase system is intimately related to the large granular (mitochondrial) components of the cell cytoplasm and its functional integrity is dependent upon the physical and osmotic integrity of these cell components (44). In this connection, it should be noted that, in general, cancer tissues tend to have a lower calcium and a higher potassium content than do normal tissues (35). These changes in electrolyte content are often cited as the basis of the decreased cohesiveness of cancer cells (68). However, it is also pertinent to recall that potassium favors hydration of biocolloids and would thus be expected to influence the functioning of the cyclophorase system. In addition, the ability of calcium to form poorly ionized complexes with citrate might well be expected to bear some relation to the citric acid cycle (71). Measurement of cyclophorase activity in neoplastic tissue indicates a decreased activity as compared to most normal tissues (36, 78, 79, 107). An additional feature of interest in regard to the components of the tricarboxylic cycle is that this is the biochemical area of convergence of carbohydrate, protein, and lipid metabolism, viz., transamination and fatty acid oxidation and condensation reactions (63).

From an energetic standpoint, it is significant that phosphorylation is commonly coupled with oxidation since the energy of oxidation is employed to create high energy phosphate bonds. The utilization of such high energy phosphate bonds via the intermediation of adenosine triphosphate represents the final common path in the conversion of biochemical energy into biological work function (54, 62). In this regard it should be noted that the fermentation reactions are less efficient as a source of energy since they yield only 2 high energy phosphate bonds per mole triose oxidized, whereas respiration via the cyclophorase system yields 12 to 15 high energy bonds per mole triose (44).

In view of the importance of these reactions in cellular energetics it is not surprising that therapeutic attempts have been made to utilize agents which might selectively inhibit cancer tissue on the basis of the aforementioned metabolic differences from control tissues. Among such agents (enzyme inhibitors) are fluoride and iodoacetate which interfere with fermentation reactions, malonate and fluoroacetate which interrupt the tricarboxylic acid cycle, and azide which inhibits cytochrome oxidase activity. The results of our clinical studies with such agents indicate that while some temporary inhibition may occur in some cancer tissues, in the main the therapeutic rewards are unsatisfactory (5, 9). On the basis of these studies we concluded that "the in vitro biochemical characterization of tumor tissue may be a measure of a manifestation of malignancy rather than of its subtle essence, or it may fail to reflect the ability of tissues to adapt to unfavorable environmental factors by alterations of their metabolic pathways" (5).

It should also be mentioned that more recently, in an extensive study of human cancer tissues, we demonstrated the existence of marked differences in regard to the in vitro dehydrogenase activity of diverse cancer types and also among individual cases of the same type of cancer tissue. These variations were encountered in regard to the endogenous dehydrogenase activity and also the effect of various cancer chemotherapeutic agents on such metabolic activity (15, 17).

Synthesis of nucleoprotein. It is well known that protein represents the minimal fabric of living matter and of the proteins the nucleoproteins are the sine qua non. In fact, some viruses appear to be little more than self-duplicating nucleoprotein molecules. It is thus of great interest that nuclear alterations figure so prominently in cancer tissue. Actually the first biochemical observations on cancer tissues were made not by biochemists but by microscopists who noted changes in the appearance and staining properties of the nuclei of cancer cells. The familiar hyperchromatism, nucleolar prominence, and cytoplasmic basophilia of immature and malignant cells represent differences in nucleoprotein content from homologous control cells. In this regard it should be recalled that the therapeutic effect of x-rays and radiomimetic drugs like the mustards are visualized by profound nuclear alterations which include fragmentation, polyploid, and, finally, cell death.

The countless observations on exfoliated tumor cells according to the method of Papanicoloau as well as the more detailed and specialized techniques of radioactive phosphorus uptake and spectrophotometric absorption studies of tumor cell nuclei leave little doubt that an increase in nucleoprotein content is a characteristic accompaniment of malignant neoplasia (41, 60, 69, 74, 76).

It should be interjected, however, that malignant cells may vary markedly in the degree of such change, ranging from a four-fold increase in chromosomal (and nucleoprotein) content to cells with nuclei indistinguishable from the control cells. Furthermore, it is not infrequently observed that non-neoplastic pathological processes may result in nuclear changes which are very similar if not identical with those of malignant cells (99).

Despite these limitations, however, nucleoprotein alterations remain as the most prominent structural and chemical feature of malignant cells. For this reason there has been a great deal of interest in nucleoprotein metabolism in cancer tissue. While our knowledge of nucleoprotein synthesis and maintenance in living tissues is still quite fragmentary, certain concepts appear to be accepted at present. Nucleoproteins consist of complex but highly specific moieties of nucleic acids and proteins. The nucleic acids represent combinations of nucleotides and occur in two main types, the so-called cytoplasmic and nuclear types. The former is characterized by the presence of ribose nucleotides, and the latter by the presence of desoxyribose nucleotides. The nucleotides themselves may be further distinguished according to whether they are purine or pyrimidine nucleotides. From the standpoint of nucleoprotein synthesis, the following steps are recognized: (a) the utilization of simple precursors such as carbon dioxide, formate, and glycine to form the purine and pyrimidine rings, (b) the creation of nucleotides from the organic base plus pentose and phosphate, (c) the combination of nucleotides to form nucleic acids, and (d) the combination of nucleic acids and protein in a highly unique fashion to produce the nucleoprotein (22, 25, 43).

It is important to keep in mind that the creation of nucleoproteins from the simple precursors is an anabolic or synthetic process and as such is dependent upon the energy-yielding catabolic degradations of substrates as described (55, 58).

On the basis of the previous discussion it is evident that therapeutic benefit might accrue if it were possible to interfere selectively with some of the various steps in nucleoprotein synthesis in the tumor cells. To some extent current information tends to corroborate this potentiality. Urethan, mustards, antifols, and 6-mercaptopurine interfere directly or indirectly with nucleoprotein synthesis and exhibit tumor destructive actions which seem to parallel this biochemical activity (4, 30, 90, 91). However, the possibility also exists that the therapeutic effects might be secondary to or in addition to an effect on the energetic reactions which drive the anabolic syntheses. Thus we found that the chemotherapeutic benefits of mustards and x-ray are correlated with their in vitro effects on the dehydrogenase activity of human cancer tissue (15, 17). The oft-repeated observation that caloric restrictions may curtail tumor growth is also conceivably related to limitations of substrate or energetic curtailment rather than a direct effect on the more complicated phases of nucleoprotein synthesis (97).

An additional facet of nucleoprotein activity is also of interest in the present discussion; namely, nucleoprotein control of synthetic and enzymatic activities of the cells (86). Since many carcinogenic agents are also mutagenic, it would be expected that some change would be produced in the controlling influence of the nucleoproteins on synthetic reactions. These changes might be too

subtle to be detected in the nucleoprotein itself with currently available methods of analysis. However, the result of such changes would be reflected in the controlled reactions and the latter might be measurable. It is noteworthy that cancer tissues do show certain very definite tendencies to undergo convergence in enzyme patterns and metabolic behavior to a common type of tissue as compared to the divergent activities of their respective tissues of origin (10, 48). In addition, there is some evidence that the protein components of malignant tissues may be altered so as to diminish species specific qualities. This feature may account in part, at least, for the heterotransplantability of malignant tumors (46). Furthermore, in some cases it would seem that the protein synthesis of cancer cells produces a somewhat different end product than the native cell proteins of the host (40, 67, 100). The frequent occurrence of lymphoid infiltrates around the sites of origin of carcinomas is consistent with such a viewpoint (21). In addition, in a smaller number of cases the invading cancer tissues are found to be associated with marked lymphoid and plasma cell infiltrates, a morphological counterpart of the appearance of lymphoid reactions in heterologously transplanted experimental tumors that are undergoing regression (64). Of great practical significance is the observation that lymphoid infiltrates in human cancer tissue are associated with unexpectedly prolonged survivals (12, 65, 72). It would appear profitable to study these reactions in greater detail. If it were possible to make cancer tissue proteins antigenic, we should have a valuable therapeutic tool.

While the details of the biological behavior of human cancer are beyond the scope of this article, it must be emphasized that the variations in behavior and the spontaneous regressions and exacerbations of the disease justify consideration of the tumor-host relationship (24, 39, 66, 73). It is therefore pertinent to inquire as to what biochemical manifestations are demonstrable in the host tissues. Various reviews of the chemical changes in the host tissues have been reported from our own and other laboratories (14). However, we shall limit our detailed comments to three areas of study which appear of interest to the discussion, i.e., tumor stroma, adrenocortical metabolism, and the plasma proteins.

Tumor stroma. It is well known that cancer tissue very commonly evokes a marked fibroblastic proliferation (desmoplasia) which in some cases constitutes the bulk of the tumor, viz., linitis plastica. However, it has only been with the advent of histochemical procedures capable of demonstrating respiratory enzyme activity that it has been demonstrated that the tumor stromal capillaries and peritumor cell fibroblasts are possessed of an unusually high rate of dehydrogenase activity. Furthermore, activity of this nature tends to be stimulated by fluoride, a phenomenon different from that of normal connective tissue elements and similar to tumor cell metabolism (11, 25). The observation that the stromal elements of a tumor manifest so great a part of tumor respiration is of interest in regard to chemotherapy. Microscopic studies of breast and prostatic tissues undergoing regression due to hormone therapy do not show the nuclear aberrations and cytonecrotic changes so common in tumor cell destruction by x-rays, mustards, or urethan. In contrast they show the entrapment and shrinking of the tumor cells in a dense fibrotic stroma (81, 84, 98). These observations suggest that the primary effect might be on the stroma and only secondarily on the tumor cells. In view of the enhanced metabolic activity of the tumor stroma in many cancer tissues it is not inconsistent that interference with such activity could result in a damaging effect on the associated tumor cells. Further work is needed to define the factors operable in regard to tumor cell-stromal metabolic interrelationships and their implications to chemotherapy.

Adrenocortical metabolism. Clinical observations which include a tendency toward hypotension, positive Kepler-Robinson water tests, fixed hepatic glycogen and decreased albumin synthesis which are correctable by the use of adrenocortical extract suggest that an altered adrenal function is not an infrequent occurrence in cancer patients (1, 83, 108, 109). Furthermore, detailed studies of urinary steroid excretion patterns provide evidence of an alteration in adrenal function in cancer patients (37, 38). In view of the known relationship between adrenocortical function and the collagenous and pigmentary systems it is pertinent to note that there have been numerous reports on the association between cancer and systemic connective tissue alterations, and on the other hand the activation of acanthosis nigricans (2, 33, 34, 56, 61).

In a study of the dehydrogenase activity of the adrenal glands of mice with spontaneous breast carcinomas we have observed certain very defi-

nite alterations. The zona glomerulosa of female tumor mice revealed an increase in the endogenous dehydrogenase activity as compared to the findings in the controls (18). In addition, it was found that while the dehydrogenase activity of the control zona glomerulosa was inhibited by DOCA and stimulated by cortisone and compound F, the reverse relationship was found in the zona glomerulosa of the adrenals of tumor mice (16, 20). These findings suggested that there had been a change in steroid synthesis of the adrenal cortex in the tumor animal wherein the zona glomerulosa was producing less mineral corticoids and more of the catabolic glucocorticoids. This is of interest in regard to certain observations on the biological behavior of cancer. It has been shown that in its earlier stages of development a tumor will not withstand transplantation to control hosts of the same strain, although it will take if transplanted to another animal bearing the same type of tumor (46). This would indicate that the tumor host is altered in its reactivity against tissue transplants; in short, it is less capable of responding to antigenic stimulation. In view of the known antagonistic action of glucocorticoids on antigen-antibody reactions this histochemical demonstration of a derangement in adrenocortical synthetic activity is most pertinent.

Plasma proteins. It is well known that the plasma proteins undergo changes in a variety of pathological conditions and specific changes in the plasma proteins of cancer patients have been sought for by numerous investigators (3, 53, 70, 106). To date, however, there is no evidence that cancer is associated with the appearance of any unique plasma protein component or a specific alteration in any of the usual protein components of plasma. Nevertheless, there are abundant data to indicate that distinct changes do occur in the plasma protein pattern of patients with progressive malignant neoplastic disease. In general, there is a well defined tendency toward a lowering of the albumin and an increase in the alpha globulins, in fibrinogen, and sometimes in the gamma globulins. The beta globulins are usually reported as being essentially unchanged. In some instances they may be moderately increased but in far advanced cases they tend to be subnormal. Similarly, the gamma globulins which tend to be increased in moderately advanced cases show a distinct tendency to decrease in far advanced and preterminal cases.

The fall in the levels of the beta and gamma globulins in the plasma of preterminal cases cannot be assumed to be merely the result of cachexia and negative nitrogen balance since in the same cases there is usually a concomitant rise in the alpha globulins, particularly in the alpha-1 component. In fact, it has been our experience that the ratios, beta/alpha-1 globulin, and gamma/alpha-1 globulin are more closely correlated with the clinical status of the case than are the absolute levels of these proteins. Thus, we have observed that the cases of disseminated malignant neoplastic disease in which the patients are nevertheless clinically well and active are characterized by normal or increased ratios of gamma/alpha-1 and/or beta/alpha-1 globulins. It is indeed interesting that the plasma proteins of cancer patients should provide suggestive evidence of antagonistic factors of the tumor in the host. Unfortunately, the available data is inadequate to show whether the elevated gamma globulins represent specific antitumor antibodies or nonspecific gamma globulin protein.

COMMENTS

In order to assess the significance of the aforementioned chemical data in regard to cancer chemotherapy properly, it is necessary to view them in terms of the biological behavior of cancer. In recent studies we observed that cancer lethality varied as the direct function of the growth potential of the primary tumor and tumor trophic factors, and inversely as the function of the tumor-retarding factors of the host (13, 14, 23, 24). The growth potential of the tumor could be evaluated according to the degree of nuclear anaplasia with particular reference to nuclear hyperchromatism, anisonucleosis, and the incidence of mitotic activity. The tumor trophic factors are exemplified by the adverse effect of pregnancy and lactation on the clinical behavior of breast carcinoma and the beneficial effects of castration or hormone therapy on breast and prostatic carcinoma. Structural representations of tumor-retarding factors were manifest in the form of lymphoid infiltrates in the primary tumor and sinus histiocytic reactivity of the regional lymph nodes (6, 12, 13, 23, 65, 72). These various factors were found to behave as independent variables so that the biological behavior in individual cases reflected the sum of the degrees of such findings. Thus, a patient having poor nuclear differentiation (high nucleoprotein content and

mitotic activity) might still survive for prolonged periods of time when there is a marked lymphoid infiltrate in the tumor and/or a sinus histiocytic reaction of the regional nodes.

In view of the biological considerations cited, cancer chemotherapy might rationally be directed along three distinct lines: (a) direct tumor cell destruction via interruption of its metabolic activity or reproductive function, (b) elimination of tumor-trophic factors, and (c) enhancement of tumor-retarding factors. For the sake of clarity we shall consider the various chemical data in relation to these approaches.

Tumor Cell Destruction

This approach, which currently appears to be the most popular, is intimately related to tumor cell energetics and nucleoprotein synthesis.

Energetics. As indicated, there is no evidence that cancer tissues possess energetic reactions of a type not found in normal tissues. However, they tend to exhibit a greater degree of glycolytic (fermentative) metabolism than most control tissues. In many discussions of the chemical characteristics of tumor tissue it is implied either directly or tacitly that such behavior is intimately connected with the phenomenon of malignancy per se. It should be recalled, however, that among the most common microscopic structural features of cancer tissue is the loss of the critically oriented vasculoparenchymal cell arrangement observed in non-neoplastic tissues. With these structural alterations it must follow that oxygen availability would be compromised. Under circumstances of this nature a fermentative type of metabolism would be expected, not because this chemical behavior is an invariable accompaniment of malignant tumors but because cells which failed to adapt to an anaerobic environment would fail to survive. The persistence and proliferation of the tumor cells would thus be de facto evidence of their ability to adapt to an anaerobic type of environment rather than the result of or a necessary accompaniment of malignancy. If the malignant state truly required a fermentative type of metabolism then chemotherapeutic efforts aimed at the specific inhibition of glycolysis should prove to be critical in the control of the disease and in the selective destruction of the cancer cells. If, however, the high rate of glycolysis in cancer tissue merely reflected an adaptive change, then therapeutic attempts would be limited by the availability of oxygen and the ability of the tumor tissue to carry out respiratory activity. Since chemical data would indicate that the respiratory enzyme systems in tumor tissues, while lowered, are present and capable of adequate function this per se would not be expected to be a limiting factor. Furthermore, as the oxygen availability would also vary in different areas it is not expected that all or even the majority of tumor cells would be adversely affected by inhibition of glycolytic reactions. Certainly our clinical experience with the use of fluoride and iodoacetate would be consistent with these expectations (9).

Such predicted variability in the energetic reactions among cancer tissues is confirmed by our observations of marked variability in the in vitro dehydrogenase activity of human cancer tissue. However, it should be mentioned that our measurements do indicate that the chemotherapeutic response and metabolic activity of individual cancer tissues may often be correlated. Thus, radiosensitive cancer tissues are characterized by an appreciable inhibition of in vitro dehydrogenase activity by urethan. Conversely, radioresistant tumors do not exhibit this urethan effect in vitro. Similar relationships have also been demonstrated in regard to the in vitro and clinical effects of triethylene melamine and triethylene melamine plus urethan (22). However, this approach to cancer chemotherapy yields only temporary benefit since in vitro and clinical resistance subsequently develops. Furthermore, agents of this type are evidently limited in their usefulness by the degree of differential sensitivity between cancer tissues and normal tissues, particularly those of the hematopoietic system. Despite the occurrence of some dramatic temporary remissions of cancer and the in vitro predictability, there does not appear to be any real expectation that these agents or their derivatives will ever cure cancer or even represent much more than a temporary ally along the path of rational cancer chemotherapy. However, it is not to be inferred that there is no possibility that critical differences in energetics may exist between control and malignant tissues. Nevertheless, we must be realistic enough to admit that, to date, no such data are available, nor is it necessary to postulate the existence of mechanisms to explain the behavior of cancer tissues.

Nucleoprotein synthesis. The typical cancer cell has a high nuclear-cytoplasmic ratio as compared to control cells. From a chemical standpoint this is equivalent to stating that there is an increased

rate of nucleoprotein synthesis as compared to cytoplasmic protein formation. Another possibility would be a decreased rate of destruction of nucleoprotein in the tumor cell as compared to control cells. In either case an enhanced nucleoprotein content would result. However, as indicated, there is as yet no evidence that the nucleoproteins of cancer cells are fabricated in a different fashion than those of control tissues. Thus, the observed differences must be explained in terms of rate phenomena. However, nucleoprotein content is by no means constant in all cancer cells even in those from the same sites of origin. Nonetheless, it does appear that other things being equal, the lethality of cancer has a fairly well defined relationship with nucleoprotein content as expressed in conventional staining reactions (13, 23). To this extent the basic behavior (malignant character) is correlated with nucleoprotein content. On the other hand, in some cancer cases the nuclear chromatin (nucleoprotein content) is less than is found in many control tissues even from the same site, and certainly less than tissues in a hyperplastic but non-neoplastic state. For this reason, chemotherapy aimed at interference with the rate of nucleoprotein synthesis can only be effective against those cells in which the rate is high and appreciably greater than that in the most active normal cells, viz., bone marrow. It is noteworthy that an agent such as 6-mercaptopurine is highly toxic to normal bone marrow and ineffective against most types of cancer. One would expect similar inadequate results with any systemic agent of which the efficacy was dependent on differential rates of nucleoprotein synthesis.

However, despite our current limitations, it is of importance to emphasize that it is possible to achieve appreciable, although temporary, benefit through the medium of our present knowledge of energetics and nucleoprotein synthetic mechanisms of cancer tissue. Further, the possibility of improving therapeutic efficacy by the simultaneous or sequential combinations of agents has theoretical as well as practical justification (8, 9, 15, 17, 19, 22, 77, 87, 89, 92). In addition, it should be kept in mind that changes in metabolic activity occur in tumor cells surviving exposure to chemotherapeutic agents. Awareness of this allows for the possibility of additional benefit by changes in therapy (29).

In view of the initial metabolic variability among tumors and their later changes following therapy it would be desirable to have some method of individualizing the treatment on the basis of in vitro measurements. Studies in our laboratory as well as by others would indicate the feasibility of these procedures (15, 17, 22, 107).

Careful individualization of chemotherapy and at times judicious neglect are most consistent with the state of our current limited knowledge and the aim of achieving maximal benefit with minimal attendant toxicity.

Elimination of Tumor Trophic Factors

This approach is limited at present to endocrine-dependent tumors (52). Furthermore, its efficiency is limited to the individual cases in the group in which the endocrine dependence is retained. Unfortunately, this dependence may subsequently disappear. Although the therapeutic benefits in individual cases are often most gratifying and of longer duration than with any other modality of systemic therapy, the applicability of this approach is limited to only a small per cent of cancer cases.

Accentuation of Tumor Retarding Factors

The literature contains numerous reports on immunological studies of cancer (50, 94). While no consistently effective therapeutic agents have been developed, the concept of the participation of the reticuloendothelial system persists in medical thinking (51, 101).

Our own studies on the natural behavior of cancer would suggest that there might be two distinct approaches to the problem: (a) antigen-antibody reactions between host and tumor, and (b) reticuloendothelial reactivity.

Antigen-antibody reactions. Among the most subtle attributes of the nucleoproteins are their genetic control over cell metabolism. Thus, the types of enzymes found in a cell appear to be genetically determined. In keeping with this capacity the types of cytoplasmic proteins produced should reflect the genetic influence of the nucleoproteins. Evidence of such change might be demonstrable by the very sensitive methods of immunochemistry. Actually some suggestive data along this line are available (40). Of great practical significance would be the occurrence of a genetic change in the cancer cell proteins which rendered the cancer cell antigenic to the host of origin. If this phenomenon was a prominent feature then the tumor would never appear clinically as it would regress shortly after its ori-

gin. This would be analogous to the regression of carcinoma implanted into an alien host. However, such regressions might not occur despite a potential antigenic change in the cell proteins if the host were deficient in his capability to respond to antigenic stimulation. Indeed there appear to be direct observations that such deficiencies actually occur in some cancer patients (75, 94). The fall in gamma globulin levels in preterminal cancer cases would also be consistent with a decreased host responsiveness. The various chemical and histochemical studies of adrenocortical function cited above would also be consistent with an alteration of host responsiveness to antigenic stimulation. These data related to antigen-antibody reactions to cancer would suggest that the control of cancer growth might be approached along two distinct lines: the enhancement (a) of host "allergic" mechanisms, and (b) of the antigenic nature of the tumor cell.

With regard to enhancement of host "allergic" mechanisms (96), Greene (45) has reported some provocative observations which are pertinent to this phase of the problem. He has demonstrated that certain chemical agents have a tumor-inhibiting action which appears to be based on stimulation of the allergic mechanisms of the host. In this connection it would also be of interest to know whether adrenalectomy would produce clinical benefit in nonhormonally dependent cancer cases in which lymphoid infiltrate was prominent in the primary tumor.

There appears to be a critical need for a thorough investigation of the significance of the decreased beta and gamma globulin levels which are found in patients with rapidly progressive cancer. Furthermore, it would seem desirable to evaluate the effects of the administration of these protein components on the course of the disease. In this connection reference should be made to a study by Brohult who administered large doses of iron-binding beta globulin to children with acute leukemia (26). By this treatment she was able to elevate the beta globulin levels in the blood. Associated with such an increase in the plasma beta globulins she noted two features of interest: the appearance of plasma cells in the peripheral blood and the occurrence of partial clinical remissions with a simultaneous tendency to normalization of the number of blood cells and maturation of the peripheral blood.

While no hard and fast conclusions can be drawn from this preliminary study, it does justify further evaluation of this hitherto neglected approach to cancer chemotherapy. It would be our opinion that the combined administration of beta and gamma globulins might prove even more rewarding. The ideal approach may be to try to introduce a benign non-neoplastic condition which is characterized by an elevation of beta and gamma globulins. One such condition is sarcoidosis which is also of pertinent interest from other considerations, vide infra.

With regard to enhancement of the antigenic nature of the tumor cell, the exact method of accomplishing this in the tumor-host relationship is not clear at present. However, the possibility deserves serious attention. Closer attention to the phenomenon as it occurs naturally might yield pertinent information as to how to accomplish such changes experimentally.

Reticuloendothelial reactivity (*host-retarding influences reflected in sinus histiocytic reactions in the regional lymph nodes*). This phase of the problem is virtually unexplored. However, it is clear that the lymph node reactivity must be evaluated in regard to whether it is a primary response to the tumor or a secondary reflection of a more generalized bodily (hormonal) change. If the former is the case, then extracts of lymph nodes might well be of significant therapeutic value. In the latter situation, lymph node extracts might not be of direct value per se although the blood of the patients might have therapeutic value.

In addition, a natural extension of such an investigation would be to seek benign conditions characterized by similar reactive lymph node changes. The closest approximation to this, of which we are aware, is sarcoidosis. In this connection it is significant to note that there is only one reported case of coexistent sarcoidosis and carcinoma. Our personal experience includes only one such case (unreported), wherein the patient had carcinoma of the tonsil and of the vulva 25 and 10 years ago, respectively, but is well at present. It would be of great interest to investigate the effects of blood from sarcoid patients on the behavior of human cancer.

These considerations of tumor-host relationships are also significant in regard to the use of x-ray therapy and lymphocytolytic chemotherapeutic agents such as mustards and cortisone. Since these treatments might destroy or compromise the reticuloendothelial tumor-retarding factors, temporary inhibition of the tumor cells might be attained in some cases at the expense of

a lessened host resistance. It is not uncommon to observe an enhanced growth rate after a temporary regression of cancer tissue from x-ray or mustard therapy. It would appear prudent to individualize cancer therapy in accord with both the primary tumor and the host-retarding factors.

The various data and comments cited indicate that as yet we are unaware of any unique and invariable biochemical attributes of malignant neoplastic tissue which might serve as a basis for a tumorcidal or tumorstatic chemotherapeutic approach of general applicability. The data are more consistent with the thesis that the eventual control of disseminated malignant disease will be dependent upon the utilization of biological processes, the existence of which appear to be well documented. However, the ability to manipulate these processes at will must await future investigations.

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ABSTRACTS OF CURRENT LITERATURE

SURGERY OF THE HEAD AND NECK

EYE

Primary Melanocarcinoma of the Choroid; Considerations with Reference to a Case (Melano-carcinoma primitivo da coróide Considerações em torno de um caso). OSWALDO MACEDO. *Arq. pat.*, 1954, 26: 296.

THE PATIENT, a married laborer, without pertinent previous personal or family history, had suffered from visual disturbances for 7 years. After one year the sight of the left eye was completely lost, without pain, and the eyeball began to enlarge. After 3 years the eyeball ruptured to permit the outgrowth of a cauliflowerlike, reddish yellow carnification.

At the time of examination the tumor was the size of a fetal head, apparently hanging from the trunk of the optic nerve. The pain was so intense that the patient was obliged to support the mass with his hand.

At operation the protruding masses were cut away with curved scissors at the level of the extraocular peduncle. Then the conjunctiva was incised with the cautery and the tumor-filled eyeball was dissected back as far as the retrobulbar fat and enucleated.

The orbital cavity was now carefully examined. The diameters were all conserved and no softening or other macroscopic involvement of the orbital walls could be found in spite of the fact that the lateral border of the cavity had presented a suggestion of erosive changes on the roentgenogram. The orbital floor was reconstituted with the aid of the palpebral mucosa and the residua of the retrobulbar tissue. The palpebra could be conserved.

Microscopically, the tumor was composed of variously shaped, polygonal or fusiform cells. The nuclei were situated more or less centrally; they were ovoid or rounded, poor in chromatin, and with evident nucleoli. The tumor "stroma" was of conjunctival character and exhibited extensive areas of necrosis and abundant cellular infiltration which were predominantly of lymphocytic character. These infiltrating cells were observed inside of the tumor cells themselves. Within the tumor cells was also abundant pigment, identifiable as melanine.

The final diagnosis was melanocarcinoma of the choroid. —*John W. Brennan, M.D.*

Human Chorioretinal Burns from Atomic Fireballs. H. W. ROSE, DAVID V. L. BROWN, VICTOR A. BYRNES, and PAUL A. CIBIS. *Arch. Ophth.*, Chic., 1956, 55: 205.

THE AUTHORS discuss human chorioretinal burns caused by atomic fire-balls. The injurious effects from atomic and hydrogen detonations result from glare and from burning.

The ophthalmoscopic appearance of burns of this nature in humans resembles eclipse blindness, and in rabbit experiments, nuclear devices.

The history, ophthalmoscopic findings, and visual impairment in 6 patients with chorioretinal burns due to atomic flash are described. In case 1, that of a relatively recent exposure, there were no ophthalmoscopic findings and only a relative central scotoma. Restoration of visual function in this case is possible. In case 2, the fundus was normal but the scotoma is probably permanent because it has persisted for a period of more than 7 months after exposure. In cases 3, 4, 5, and 6 there was ophthalmoscopically visible evidence of chorioretinal tissue replaced by scar tissue, consequently visual function is permanently destroyed. The shape of the lesion in case 6 strongly suggested the shape of the early fireball. The lesion was surrounded by tension lines, indicating the possibility of impending retinal detachment. In the same way, a burn on the optic disc, the papillomacular bundle, or a major vessel, would result in serious consequences. Macular lesions are, of course, serious because central vision is lost.

The extent and severity of the chorioretinal damage depends on the energy output of the atomic device, the temperature of the fireball during exposure, the distance, and the attenuation by the atmosphere, as well as on the duration of exposure, as limited by the blink reflex, the transparency of the ocular media, the size of the pupil, and the absorption by the pigment epithelium. It is also pointed out that the damage of a night-time atomic detonation is far greater than that which takes place in bright daylight due to the larger size of the pupil at night.

—*Joshua Zuckerman, M.D.*

Macular Cysts; a Dominantly Inherited Affection with a Progressive Course. ARNOLD SORSBY, MARY SAVORY, J. B. DAVEY, and R. J. LESLIE FRASER. *Brit. J. Ophth.*, 1956, 40: 144.

HOLES AT THE MACULA are generally assumed to be cysts in the central area. Cyst formation at the macula may be the response to a number of different stimuli, such as trauma and vascular disturbances, as well as macular dystrophies.

The authors point out that bilateral macular cysts as a genetic entity have clear-cut features; primarily, they are dominantly inherited and show a progressive

course. Their study shows that the affection is probably congenital. During the quiescent stages of the affection, central fields, color vision and dark adaptation are unchanged. Visual disturbances tend to develop in middle age and appear to be determined by rupture of the cyst followed by slow pigmentary degenerative changes, the lesion being essentially an extensive defect of the first neuron. An occasional variant of the cyst is a nonpathognomonic pigmentation of the central fundus area.

The differential diagnosis, before degenerative changes occur, presents little difficulty, and the primary conditions to consider are Best's disease and macular dystrophy. The findings in Best's disease are essentially identical and there is some question whether this represents a separate entity. Macular dystrophy generally does not show the dominance found in macular cysts, though some cases of macular dystrophy of a dominant nature have been described.

The authors present the cases of 5 families with dominantly inherited bilateral macular cysts. Two of these families had been observed over three generations and 3 over two generations. Regular dominance was observed in 4 of the families, and was nearly complete in the fifth family.

—Andreas V. Mortensen, M.D.

Experimental Approach to the Pathogenesis of Retrolental Fibroplasia; Effect of Oxygen Exposure on the Electroretinogram in Kittens. Bo E. Hellström. *Arch. Opth.*, Chic., 1956, 55: 211.

The experimental approach to the pathogenesis of retrolental fibroplasia is discussed.

The conviction is growing that exposure to oxygen is intimately related to the occurrence of retrolental fibroplasia in premature infants. The immediate relationship is not exactly known and many problems remain to be solved.

Animal experimentation was performed to gain more information concerning the pathogenesis of retrolental fibroplasia.

The influence of oxygen exposure on retinal function was determined in kittens by the electroretinogram (ERG). It was found that exposure from 85 to 95 per cent oxygen for from 10 to 13 hours did not cause any significant changes in the ERG in 2-week-old kittens. Kittens raised from birth up to 21 to 28 days of age in 70 per cent oxygen frequently showed an abnormal negative ERG, but older kittens did not show the same sensitivity. This finding indicates an injury to the retina explainable either on the basis of ischemia caused by vaso-obliteration or as a direct cytotoxic effect of oxygen.

There was no aggravation of the abnormality of the ERG on transfer to air. On the contrary, most abnormal electroretinograms tended to normalize in a few weeks.

Hellström discusses the significance of these findings in the interpretation of the mechanism of oxygen injury in the pathogenesis of retrolental fibroplasia.

Regardless of whether the mechanism of oxygen injury in the retina of kittens is primarily ischemic or cytotoxic, it is concluded that retinal damage reflected in an abnormal ERG occurs while the animal is still under oxygen. There is no evidence that transfer to air implies an exaggeration of this disturbance. On the contrary, as indicated previously, the vasoproliferating phase which follows is electroretinographically accompanied by restoration to normal.

If identity is accepted between the oxygen-induced disease in kittens and the early stages of retrolental fibroplasia in premature infants on the basis of their close histologic resemblances, the vasoproliferating stage, described as the first clinical stage of the disease, can be interpreted as a secondary phase, and a metabolic injury had already occurred when this phase was starting. If the vasoproliferating changes represent a reactive reparative phase, it remains to be explained why in premature infants this reaction sometimes is so excessive as to cause the well known residual lesions, with vitreous organization and retinal detachment.

—Joshua Zuckerman, M.D.

EAR

The Evolution of the Surgery of Chronic Otitis; Tympanoplasty; 123 Cases (L'évolution de la chirurgie des otites chroniques; la tympanoplastie; a propos de 123 cas). R. Maspétiol, Paul Aboulker, and Semette. *Presse méd.*, 1955, 63: 1641.

The authors performed the Wullstein and Zollner procedure in 103 instances of chronic middle ear disease and found that essential gains in hearing were procured in approximately a half of the patients operated on.

The procedure consists essentially in the application of a cutaneous flap to the freshened surface of the tympanic membrane, or to the surfaces of the middle ear cavity if the tympanic membrane cannot be used. The operation is preceded by an antroatticotomy to dry up any residual suppurative discharges.

The procedure is not a standardized one, but must be varied to fit the conditions encountered in the individual case. The skin graft may be used merely to seal the perforation in the typmpanic membrane, or it may actually form a part of the chain of sonic conduction where the normal ossicular chain has become disrupted. If the stapes is moveable in the oval window the articular surface of the stapes with the normal incus is freshened and the graft is applied to this surface. This substitutes, in a measure, for the loss of the attachment of the long crus of the incus. The cutaneous graft may take the place of the ossicular chain of conduction of the sound waves.

No matter how extensive the fusion of the graft to the posterior regions of the middle ear cavity may be, an attempt is always made to leave a space, or air-cushion, to separate the graft from the round window and the eustachian tube. This space is usually secured by placing a resorbable gelatin sponge between the inner wall of the anterior part of the tympanic cavity and the cutaneous graft. This cushion of air secures to the membrane of the round window the physiologic capacity of bulging outward in response to the displacement of the sound-conducting stapes induced by the sonic wave.

It is necessary that the middle ear structures be adequately studied and prepared. Anything which will interfere with the proper function of the new sound-conducting medium must be corrected. The

eustachian tube must be open, the oval and round windows must be unobstructed, and the movements of the conducting apparatus must be as free as possible to move with the sonic impulses.

A word of warning must be issued. At the pre-operative test of the hearing capacity the authors have frequently been surprised, in view of the extent of the disease, at the amount of residual hearing. They think that the adhesions present actually aid in sound conduction, perhaps by connecting the ossicles which would otherwise have no adequate connection. The authors conclude that many of the unsatisfactory results obtained from this method of tympanoplasty arise from tampering with these adhesions, and they recommend minute study of the conditions present in the sound-conducting apparatus before the reparative procedure is attempted. —*John W. Brennan, M.D.*

Primary Grafting of Fenestration and Mastoidectomy Cavities; Additional Experience with Primary Grafting of Fenestration, Modified-Radical, and Radical Mastoidectomy Cavities. BEN T. WITHERS. *Arch. Otolar.*, Chic., 1956, 63: 248.

IN A PREVIOUS ARTICLE (Ann. Otol. Rhenol., 1952, 61: 656) the author reported the more rapid convalescence following radical mastoidectomy in those cases in which the mastoid bowl was skin-grafted as opposed to those not grafted. The present report concerns 33 additional cases in which an immediate split thickness graft was used. Of this group, 10 were radical mastoidectomies, 8 were modified-radical mastoidectomies, and 15 were fenestrations.

A thin graft is believed preferable to a thick one for two reasons. First, it is better because during the "stage of fibrinous fixation" which occurs during the first 24 to 48 hours the graft is nourished by plasma and "a thin graft would have a better chance." The second reason is the location of the prickle cell layer. The most active reproduction of cells in the skin occurs in the lowest part of this layer. Nourishment from the recipient site would not reach this layer in sufficient amount if full-thickness grafts were used.

The author follows the practice of leaving modified and radical mastoidectomy cavities undisturbed for 3 weeks following surgery. Sutures are removed on the fifth day. Fenestration cavities, on the other hand, are unpacked at the end of 5 days so as to inspect the tympanomeatal flap. Aseptic technique is used for all dressings for a period of one month.

The healing of the donor site, the author believes, is facilitated by the use of a heat cradle at the end of 48 hours and continued for several days.

Of the 10 radical mastoidectomies reported, a dry ear resulted in 8.6 weeks. Of the group of 8 modified radical mastoidectomies and 15 fenestrations, in the former a dry ear resulted in 6.5 weeks, and in the latter, in 4.2 weeks. —*John J. Ballenger, M.D.*

MOUTH

The Cylindromas of the Palate (I cilindromi del palato). S. LATTERI, JR. *Ann. ital. chir.*, 1955, 32: 965.

THREE INSTANCES of cylindroma of the soft palate are reported. All of the neoplasms exhibited microscopically the same wildly interwoven, disorderly interrelationship of epithelial-like or endothelial-like parenchyma and equally irregularly interwoven stromal tissue with deposits of amorphous hyaline masses, these masses either lying freely in the stroma, or as variously shaped, but predominantly rounded masses, in the parenchyma. In the parenchyma these masses were usually surrounded by rosettes of the parenchyma cells which, however, simply enveloped the amorphous substance without anywhere assuming a typical adenoid or glandular appearance. In the stroma the amorphous material had assumed the appearance of cartilage in one case and in another the appearance of typical epithelial pearl-like structures, which the author designated as pseudoperlaceous formations.

In the first case reported, that of a 47 year old male, the patient had first noted a small swelling in the soft palate 4 years previously. The mass had gradually increased in size up to that of a large apricot, it occupied the entire soft palate and extended in part over the hard palate. At first the symptoms consisted solely of dysphagia, then nasal phonation, attacks of suffocation (especially during sleep), and, finally, stertorous breathing.

At operation the tumor was found to be of firm elastic consistency and well encapsulated; it was removed without difficulty. Two years later the patient was perfectly well and without evidence of recurrence or metastasis.

The second patient, a 16 year old girl, first noted a small mass in the middle portion of the left half of the soft palate. This had remained stationary in size until a few months previously when it began to increase slowly in size. At operation the firm elastic, hazelnut-sized tumor was enucleated without difficulty. It had a rather delicate capsule but did not adhere to the surrounding tissues.

The third patient, a 43 year old country woman, had noted, approximately 2 years previously, the sensation of a foreign body in the region of the soft palate. Since then the mass had gradually increased in size until there was difficulty in swallowing and a tendency toward nasalization of the voice.

At operation the walnut-sized, fibroelastic tumor, located in the left half of the palate, was pushing the uvula to the right. It was enucleated without difficulty. The mass was enclosed in a rather delicate capsule which itself evidenced the disordered interwoven pattern characteristic of the stromal and parenchymatous cellular structure of the whole tumor.

The author concludes that the cylindroma of the palate should be included among the mixed tumors which arise on a dysembriogenetic basis. He himself does not express an opinion as to which of the three embryonic layers is responsible for its origin; however, he seems to approve of the theory, or view, recently expressed by Radaelli, that the histogenesis of this tumor fits into the vast chapter of progressive dysontogenesis, and more precisely among the mixed forms of dysontogenesis. According to Radaelli the neoplasm arises from the tardy development of embryonic cell rests, cell rests of a didermic character, viz., originating from two of the embryologic layers. This bistratal origin is evidenced, on the one hand, by the presence of osseous, cartilaginous, fibrous, and adipose tumor components, and, on the other, by

epitheliumlike and glandular components, evidently deriving from the ectoderm.

The author regards the neoplasm as relatively benign, but, nevertheless, considers that its removal should be followed by adequate postoperative roentgen therapy. —*John W. Brennan, M.D.*

Cylindroma of the Epiglottis; Report of a Case and Review of the Literature. SALVADOR AHUED V. *Arch. Otolar.*, Chic., 1956, 63: 366.

THE AUTHOR describes a case of cylindroma originating in the epiglottis, the fourth such case to have been reported in the larynx, and the second in the epiglottis. The tumor invaded the thyroid cartilage and caused large cervical metastases which appeared to respond to radioactive iodine and led to an erroneous diagnosis of thyroid carcinoma. The patient refused further treatment after biopsy, and 5 years later died of widespread metastases; tumor emboli were observed in the small branches of the pulmonary artery. The primary tumor and the distant metastases had the typical structure of a cylindroma, with anastomosing strands of uniform epithelial cells resembling basal cells which formed small lumens filled with mucoid secretion. Both the primary tumor and the metastases showed extensive deposits of calcium, a feature not previously reported in association with cylindroma.

The author reviews and discusses the literature of cylindroma of the respiratory passages.

—*John R. Lindsay, M.D.*

NECK

Penetrating Wounds of the Neck. MORRIS J. FOGELMAN and ROBERT D. STEWART. *Am. J. Surg.*, 1956, 91: 581.

THE PRESENT STUDY was undertaken to evaluate the need for early exploration of all penetrating wounds of the neck, and to correlate the results obtained with the therapy employed. An analysis of 100 consecutive penetrating wounds of the neck has been carried out. There were 65 cases of stab wounds, 33 cases of gunshot wounds, and 2 cases of shotgun blast. In 72 of the patients, recovery was uncomplicated, while in 28 of the patients complications developed, with 11 deaths.

The diagnosis of penetrating wounds of the neck is often difficult, and immediate exploration is advised. Many of these patients had little or no evidence of severe injury, and yet, of the 83 who submitted to immediate exploration, only 4 were without demonstrable injury.

The principles of therapy are: (1) adequate treatment for shock, (2) provision for an adequate airway and the restoration of normal respiratory mechanics, (3) early exploratory cervicotomy with definitive surgery, and (4) treatment of associated injuries.

Initial exploration was carried out in 83 patients with a mortality of 6 per cent. In 17 patients immediate exploration was not employed, but expectant treatment was carried out with a mortality of 35 per cent. When the cervicotomy was carried out within 6 hours after injury the mortality was 4 per cent, but when delayed the mortality rose to 20 per cent.

There were injuries of the vascular system within the neck in 44 of the cases, with 6 deaths, a mortality of 14 per cent. When surgical exploration was performed within 6 hours the mortality was 6 per cent; when delayed beyond 6 hours the mortality was 25 per cent; and when expectant nonoperative therapy was employed the mortality was 100 per cent.

Common or Internal Carotid Artery. Injury to the common carotid artery occurred in 3 patients with 2 deaths. Both of the patients who died had minimal signs on admission and expectant treatment was carried out.

Subclavian Artery. Injury to this vessel occurred in 4 cases with 1 death. Two of the patients underwent immediate exploration and 2 were treated expectantly. One of the latter was operated upon on the twenty-sixth day and made an uneventful recovery while the last patient was operated upon on the eighth day, at which time a large hematoma was entered, exsanguinating hemorrhage occurred, and the patient expired. Every effort should be made to restore continuity to these large vessels at the time of exploration and definitive surgery.

Vertebral Artery. There were two instances of injury to a vertebral artery with one death. Injury to these vessels should be suspected when (1) hemorrhage from a posterior or lateral neck wound is not controlled by proximal occlusion of the common carotid artery, and (2) bleeding from the posterior lateral neck area is associated with the fracture of a cervical transverse process. The technical difficulties in attempting to ligate the vertebral artery are often insurmountable and necessitate ligation of the subclavian artery. In most reported series the mortality from injury to a vertebral artery is in excess of 50 per cent.

Thirteen patients suffered from injuries to the airway, with 3 deaths. The principles of surgery of the trachea and larynx are (1) early recognition, which includes a high index of suspicion, (2) provision for an adequate airway, (3) definitive surgery at the time of exploration and, (4) adequate drainage often necessitating mediastinotomy.

Nine of these patients had injuries of the pharynx or esophagus. Seven of the patients made uneventful recoveries, while 2 had complications and of these, one died. The latter two patients were treated expectantly without drainage. Early definitive surgery is necessary in treating these injuries and drainage is usually required. Nasogastric intubation is an important adjunct to prevent spillage, provide gastric decompression to prevent vomiting and as a means of feeding.

Injury to the brachial plexus occurred in 7 patients. Two of the patients underwent primary nerve repair with recovery; 2 had divided nerve fibers, but primary repair was not accomplished and they have been lost to follow-up; and the remaining 3 had only a concussion type injury and recovered full function.

Three patients sustained injury of the thoracic duct. In one case the duct was repaired with the complication of a fistula for several days, and in the remaining 2 patients the duct was ligated without complication. Ligation of the duct is probably the treatment of choice since it obviates further complications.

In this series of 100 penetrating injuries of the neck there was an overall mortality of 11 per cent. This mortality rate is approximately the same as that for

all the great wars, beginning with the Civil War. Little reduction in the mortality rate has occurred in the past 100 years. Every death in the present series, excepting those due to associated injury, was due to either an inordinate delay in surgery or inadequacy of surgical exploration. The authors conclude that the only reliable method of determining the extent of injury beneath the platysma is early exploratory cervicotomy. —*John H. Davis, M.D.*

Parathyroid Crisis; Treatment by Emergency Parathyroidectomy. PHILIP R. JAMES and PAUL G. RICHARDS. *Arch. Surg.*, 1956, 72: 553.

FOURTEEN CASES of parathyroid crisis with a high mortality rate have appeared in the literature.

The authors present a case in which the patient was treated successfully by emergency parathyroidectomy. The patient, a 22 year old female, developed symptoms 13 months prior to admission. These symptoms, at various times, included anorexia, nausea, vomiting, epigastric discomfort, and aching pains in the bones of the lower extremities. Polydipsia and polyuria had been observed by the patient. On admission, a 1 to 1.5 centimeter nodule was palpable at the inferior aspect of the right lobe of the thyroid. The maximum urinary concentration was 1.012. A flat film of the abdomen disclosed right nephrolithiasis. With use of the Sulkowitch test, the urine revealed a strongly positive reaction. Skeletal examination revealed a diffuse but minimal demineralization.

The patient was completely asymptomatic during the first 2 weeks in the hospital. On the evening of the fifteenth day the patient began to complain of epigastric distress, nausea and anorexia, followed by extreme restlessness, hypotension and tachycardia. The rectal temperature rose to 105 degrees F. The patient was partially resuscitated with levarterenol drip, hydrocortisone, and the parenteral infusion of saline solution. A serum calcium at this time was 17 milligrams per cent. Emergency surgery was performed despite the precarious condition of the patient and an adenoma of the right superior parathyroid was removed. Postoperatively the patient showed gradual improvement and required intravenous calcium therapy to avoid tetany. Renal function tests performed 3 to 5 months after parathyroidectomy disclosed marked improvement. Numerous serum calcium and phosphorus determinations were normal. A definite decrease in the degree of nephrolithiasis occurred and evidence of recalcification of the bones of the skull was apparent within 3 months from the time of operation.

Chronic hyperparathyroidism may undergo an acute exacerbation (crisis) heralded clinically by the appearance of epigastric pain, vomiting, lethargy, progressing to coma, oliguria, hyperpyrenia and vascular collapse. A rising serum phosphorus and nonprotein nitrogen may indicate impending parathyroid intoxication. The pathophysiologic mechanism producing the acute crisis is poorly understood, but in reported cases of several ulcer patients, the use of a high calcium-absorbable alkali regimen had an adverse effect. Prolonged immobilization with skeletal demineralization may precipitate an acute crisis by aggravating a pre-existing metabolic dysfunction. In a suspected case of hyperparathyroidism, the authors advise a low calcium intake and avoidance of undue immobilization; serum electrolyte abnormalities are corrected promptly to avert dehydration and alkalosis. These factors enhance calcium precipitation in the renal tubules and may lead to acute renal insufficiency.

Parathyroid crisis may occur in the presence of hyperparathyroidism due to adenoma or hyperplasia. It is comforting to the surgeon to know that 80 to 85 per cent of cases of hyperparathyroidism are due to a solitary nodule. Failure to recognize the disease and to deal with it promptly by surgery results in an extremely high mortality rate.

—*Lloyd D. MacLean, M.D.*

The Epidemiologic Approach to the Etiology of Cancer of the Larynx. ERNEST L. WYNDER, IRWIN J. BROSS, and EMERSON DAY. *J. Am. M. Ass.*, 1956, 160: 1384.

THE EPIDEMIOLOGIC FACTORS involving cancer of the larynx have been studied jointly in the United States, Sweden, and India. It has been found that the relative risk of laryngeal cancer increases in proportion to the amount of tobacco smoked, and thus parallels the statistics for pulmonary cancer. Cigar and pipe smokers have a greater susceptibility to laryngeal cancer than to pulmonary cancer. This risk is greater for extrinsic cancer than for intrinsic cancer of the larynx. Consumption of alcohol by smokers (7 ounces or more of whiskey or its equivalent per day) increases the risk of both extrinsic and intrinsic cancer of the larynx, especially the latter. The risk of development of pulmonary cancer is not affected by alcohol consumption. In India, extrinsic cancer of the larynx is related to both bidi smoking and betelnut chewing. In Sweden, extrinsic cancer of the larynx in women appears to be associated with dietary deficiencies that lead to sideropenic dysphagia (Plummer-Vinson syndrome).

Smoking is the single most important factor in the occurrence of laryngeal cancer. In the absence of smoking, this type of cancer occurs but rarely.

—*Ernest D. Bloomenthal, M.D.*

Indications for Radical Surgery, Partial Surgery, Radiotherapy, and Combined Surgery and Radiotherapy for Cancer of the Larynx and Hypopharynx. JEAN LEROUX-ROBERT. *Ann. Otol. Rhinol.*, 1956, 65: 137.

CANCER OF THE LARYNX and hypopharynx may be treated by surgery or radiotherapy alone, or in combination with each other. Though adequate resection of the cancer is imperative, it is often possible to accomplish this by partial laryngeal surgery, thus preserving some laryngeal function and permitting the patient to remain an active member of society.

On the basis of the treatment of 800 patients with cancer of the larynx and hypopharynx, observed at the Curie Foundation from 1921 to 1946, the author postulates the therapeutic indications for different anatomic varieties of cancer in these locations.

When the disease is limited to a small area on the middle of the vocal cord, and there is complete preservation of mobility of the cord, the author advises simple thyrotomy and chordectomy, without post-

operative radiotherapy; this yields a five-year cure of 100 per cent. When the cancer involves the entire cord, and the cord is still mobile, surgery and radiotherapy are equally effective. When the entire cord is involved and is totally or partially fixed, surgery is preferred. The more the fixation, the more definite is the indication for surgery.

Cancer of the subglottic area causing fixation of the involved site of the larynx is essentially within the domain of the surgeon. If the disease is bilateral, a total laryngectomy is required.

Ventricular cancer is best treated surgically and total laryngectomy should be done. In cancer of the infrahyoid portion of the epiglottis, the best results have been obtained by total laryngectomy followed by a full course of radiotherapy. Cancer of the suprahyoid portion of the epiglottis is preferably treated by radiotherapy.

In the presence of metastases, if the nodes are mobile, surgery followed by radiotherapy is indicated. If the nodes are fixed, radiotherapy is preferable.

Cancer of the hypopharynx usually originates in the pyriform sinus, and is best treated by a combination of surgery and radiation. Cancers originating in the posterior pharyngeal wall are essentially a radiotherapeutic problem. —*Ely Elliott Lazarus, M.D.*

Resection of Carotid Body Tumors with Preservation of the Carotid Vessels. Turley Farrar, John W. Kirklin, Edward S. Judd, Jr., and Kenneth D. Devine. *Arch. Surg.*, 1956, 72: 595.

It is the purpose of these authors to emphasize the feasibility of removing carotid body tumors without sacrifice of the carotid arteries when the tumors are found to be in intimate association with the carotid vessels.

Since there have been no reports of spontaneous regression of carotid-body tumors, one must be prepared to accept the complications produced by a slow-growing tumor in this location if removal is not advised. The gradual growth of these tumors, encircling certain vital structures and distorting and pushing others aside, may produce serious symptoms and even death in some cases.

There has been no general agreement among either clinicians or surgeons as to the proper handling of carotid body tumors. The use of radiation therapy, whether radium or roentgen, has been of little help in controlling the growth of these tumors.

Complete removal of the tumor would seem to be the ideal treatment except that the high operative mortality rate reported in the past is sufficient to cause concern to the surgeon. This has resulted from many factors. Among these are operative and postoperative hemorrhage, pneumonia, postoperative infections, and cerebral ischemia resulting from ligation of the carotid arteries when resort is made to this procedure in removing the tumor. This last is probably the most important consideration.

Three cases, illustrating the removal of carotid body tumors and preservation of the carotid vessels in spite of intimate attachment of the tumor to the vessels, are presented. The operative technique is discussed and illustrated. The relation of this method of treatment to other methods of treatment of carotid-body tumor is discussed.

SURGERY OF THE NERVOUS SYSTEM

BRAIN AND ITS COVERINGS; CRANIAL NERVES

Obstruction of the Superior Longitudinal Sinus by Plasmocytoma. JAMES BARR and ALEX DAWS. *Brit. J. Surg.*, 1956, 43: 372.

THE AUTHORS describe a case of presumed obstruction of the superior longitudinal sinus by plasmocytoma. They point out that myelomatosis is usually far advanced before a diagnosis is made, or before it is made fortuitously by roentgen examination. The skull is commonly involved, but an increase in intracranial pressure appears to be quite uncommon. In reviewing the literature, Clarke was able to find only 7 cases of increased intracranial pressure, to which he added one case.

The case reported is that of a 32 year old male who was admitted to the hospital with a history of malaise, shivering, and fever followed by nausea and vomiting. Before admission, there had developed a stiff feeling in the neck and occipital headaches, along with diplopia and loss of visual acuity.

On neurologic examination, the patient was observed to be extremely ill and anemic. There was papilledema, with hemorrhage and exudate bilaterally, and a bilateral sixth nerve paresis. Investigations included a roentgenogram of the skull, which showed increased pressure and evidence of a translucency 2 cm. in diameter in the occiput to the left of the midline. An arteriogram was normal. Spinal fluid pressure was 300 mm. of water. Normal protein was found.

On the basis of the course and findings, a diagnosis of toxic hydrocephalus was made and the patient was treated by spinal drainage. Because, in the roentgen film, the area previously mentioned as translucent now showed a soft fluctuant swelling, an exploratory burr hole was done in the right frontal region. The tissues were seen to be thicker than normal and congested and cyanotic. The ventricle was small and collapsed after the removal of a few cubic centimeters of spinal fluid. Since the patient did not improve, an incision was made over the swelling in the occipital region and tumor tissue presented immediately, continuous with an intracranial mass which was removed, and the sagittal sinus was visualized. The latter was found to be patent. A right subtemporal decompression was done and the tissues again were noted to be congested. The tumor proved to be a plasmocytoma. Subsequent roentgenograms revealed several other translucencies of the skull, and elsewhere throughout the bony skeleton. There were other confirmative evidences of myeloma.

Postoperatively the patient improved steadily, but within 3 weeks he deteriorated suddenly with severe headache and coma, engorgement of the scalp veins, and an increase in the degree of bilateral proptosis and periorbital edema. The right pupil became dilated and fixed, while the left remained constricted. The left limb became spastic. The patient died the following day and no autopsy was performed.

The authors felt that they were misled by the history, which included a discharging left ear and pleuritic pain, along with febrile illness. The angiogram likewise being normal, they concluded that the patient had a toxic hydrocephalus. In retrospect, they thought they did not give enough attention to the translucent area until it became fluctuant. They point out that solitary bone defects in vault bones present no pathognomonic features, so that a clear diagnosis depends upon further study. The differential diagnosis includes secondary osteoma, multiple myeloma, luetic osteitis, and xanthomatosis; the latter is likely to have sharply defined edges. Meningiomas rarely produce such defects.

The authors presume that longitudinal sinus occlusion accounted for the increased intracranial pressure, with the obstruction secondary to external pressure rather than thrombosis initially. The rapid response to decompression emphasized the probable former origin. The rapid demise was apparently due to an acute thrombosis of the sinus in the region of the tumor. The types of sinus occlusion include primary thrombosis, thrombosis secondary to invasion by tumor, and nonthrombotic occlusion from external pressure. Tumors not infrequently produce slow obstructions without sinus disturbance because of the fact that sufficient time elapses for development of adequate collateral circulation. However, in the case mentioned here, the rapid occlusion of the sinus in spite of attempted formation of a collateral circulation as evidenced by the prominent scalp veins, was insufficient to prevent the development of increased pressure. The fact that the patient showed no evidence of hemiplegia or paraplegia initially may be explained by the observation of Caudill, French and Haines, that neurologic changes are less likely to occur when the sinus occlusion is secondary to external pressure rather than thrombotic in origin. In the latter case, the thrombosis may extend to the cerebral veins and produce focal damage early.

—*Edward B. Schlesinger, M.D.*

Carotid Cavernous Fistulas. A. EARL WALKER and GEORGES E. ALLÈGRE. *Surgery*, 1956, 39: 411.

THE SYNDROME of carotid cavernous fistulas is extensively reviewed. The authors' series includes 24 cases, or an incidence of 1 in 20,000 admissions. The fistulas are almost always due to a head injury, spontaneous rupture of an aneurysm, or to a congenital anomaly of the carotid artery into the cavernous sinus. The traumatic cases in the collection outnumber the cases of spontaneous rupture by about 3 to 1. Basal skull fracture is the commonest traumatic origin, by blunt injury, and an object penetrating the orbit is the commonest type of sharp-object origin. The fracture may not show on the roentgen film, and indeed the fistula may be only of academic importance because of the severity of cerebral damage. Traumatic type fistulas have a 3 to 1 male preponderance and

occur at an earlier age than the spontaneous fistulas which occur in women seven times as commonly as in men. Weakness of the intracavernous portion of the carotid artery seems to be a predisposing factor, and Delen was able to reproduce rupture of the carotid into the cavernous sinus by cannulating and injecting with force. About 30 per cent of the spontaneous fistulas in women occur during pregnancy—either in the latter half or during delivery.

Nelaton's report emphasized the importance of this lesion in causing exophthalmos. The pathologic anatomy of the fistulas may be divided into the changes produced by abnormal circulation and alterations in the carotid artery itself. The arterial pressure and pulsation in the sinus cause it to become markedly dilated along with its channels of drainage, which become thickened also. The cephalic veins, having no valves, become dilated and tortuous. The most common route of drainage is by way of the superior ophthalmic vein to the angular, facial, and internal jugular veins. Occasionally, however, the drainage is by way of the petrosal sinus to the basal sinus and internal jugular vein. Less often the arterial blood is led into the superior cerebral veins or sagittal sinus, or by the vein of Rosenthal to the vein of Galen and the sinus rectus. The channels of Rosenthal invariably become dilated and thickened.

The local pathology of the artery varies from complete transection of the vessel to a minute opening, but most commonly there is a 3 to 6 millimeter hiatus, or even multiple openings. These may be superior, mesial, or lateral, but their position does not seem to influence the degree of exophthalmos of its bilaterality. The latter seems to depend upon the size of the anterior and posterior intercavernous or circular sinus. When these are small, a unilateral exophthalmos results, as is found in 80 to 90 per cent of cases. Only 2 patients in this series had bilateral exophthalmos.

The onset may be immediate or within a period of months. The bruit is the commonest first sign, and may precede the others by weeks. Exophthalmos is the outstanding symptom and rarely occurs contralateral to the fistula but is bilateral in 10 per cent of cases. The protrusion of the eyeball is usually obliquely downward and outward. The onset varies and the protrusion may progress. Pulsation of the eyeball is synchronous with the pulse and is commonly seen; it may also be noted in the dilated veins over the forehead and in the neck. A thrill may also be felt. The bruit may vary greatly from a mild hum to becoming so annoying that the patient cannot sleep. It may be obliterated by compression of the artery or occasionally by turning the head. Auscultation reveals a crescendo systolic murmur best heard over the eyeball or temporal region. In bilateral exophthalmos the loudest murmur is on the side of the fistula. Headache is uncommon, and usually unilateral and referred to the eye and orbit. Chemosis is striking. Extraocular palsy may be due to the primary injury or to injury to the wall of the sinus, and to the degree of the amount of stretching of extraocular muscles by the exophthalmos. Diplopia occurs in one-third of the cases. In the present series diplopia was present in 2 patients, and 2 had a complete ophthalmoplegia. Extraocular palsies usually clear up rapidly if the fistula is occluded. Impairment of vision is common both due to optic nerve trauma and to injury from venous engorgement. Papilledema may occur. Blindness occurs in one-third of the cases and some loss of acuity in approximately one-half of the cases. This may be due to clouding of the lens or vitreous, glaucoma, optic atrophy, intraorbital hemorrhage, or cataracts.

The other most commonly involved cranial nerve is the trigeminal.

Differential diagnosis includes orbital encephalocele, cavernous thrombosis, retro-orbital tumors, orbital vascular tumors, and aneurysms.

Without treatment the exophthalmos usually becomes stationary, but with impairment of vision and a chronic pulsating bulging eyeball. Involvement of the orbital contents by infection is common. Occasionally there is a spontaneous cure. In the literature, about 10 per cent of cases fall in this category. Simple compression of the carotid in the neck may cause occlusion of the fistula. Other methods include the use of sclerosing agents, venous ligation in the orbit, and attempts at blocking the fistula with muscle by way of the carotid in the neck. Ligation of the carotid artery is the commonest mode of treatment. Whether the common or internal carotid should be ligated is still open to question. Complete isolation of the fistula, as in the extremities, is not feasible and does not really seem necessary for clinical cure. The adequacy of cerebral circulation is a primary factor. The mortality from ligations of the carotid for other conditions is reported to be 20 per cent, but for these fistulas only 4.7 per cent. Tests for adequacy of circulation are not entirely reliable, particularly digital compression. Angiography is favored as a means of outlining the lesion and learning the degree of collateral circulation. Adequacy of circulation may also be tested at the time of operation by clamping the vessel and observing clinical electroencephalographic changes. The work of Sweet and Bennett is mentioned in regard to the drop of pressure in the internal carotid as an index of the safety of the method. Even this, however, is considered not an adequate guide since it does not accurately measure hemispheric blood flow.

The authors' series includes the use of ligation of the common carotid in 6 cases, of the internal carotid in 6 cases, and combined intracranial clamping and cervical ligation of the internal carotid in 9 patients. The results with these methods are tabulated in detail, at 2 years after operation.

The authors conclude that trapping procedures unquestionably relieve the pulsating exophthalmos more consistently than ligation. However, they consider the incidence of complications to be high, and particularly stress hemiplegia or visual impairment as complications. —*Edward B. Schlesinger, M.D.*

Remarks on 33 Cases of Subdural Effusion in Infancy. E. Herzberger, Y. Rotem, and J. Braham. *Arch. Dis. Childh.*, Lond., 1956, 31: 44.

The authors review their experiences in the treatment of 33 infants with subdural hematoma over a two-year period. In 15 cases the condition followed purulent meningitis, in 4 there was a history of trauma, and in 13 cases no certain history of injury

could be determined. No correlation was found between the degree of brain damage, on the one hand, and the extent of membrane formation on the other.

Seven of the patients responded to repeated subdural tapping, while in 22 infants the effusion failed to dry up with simple tapping, which led to the performance of burrholes. Only 2 of the patients demonstrated membranes sufficiently heavy to require craniotomy for their removal. It was believed that the immediate results of this conservative management justified the withholding of major surgery for the removal of membrane in most instances.

—*Joseph Ransohoff, M.D.*

Concerning Pathologicoanatomic Changes in the Hypophysis After Electrocoagulation (Ueber pathologisch-anatomische Veraenderungen an der Hypophyse nach Elektrokoagulation derselben). K. H. Bauer, E. Klar, and E. Soder. *Langenbecks Arch. u. Deut. Zschr. Chir.*, 1956, 281: 420.

By means of percutaneous paranasal transethmoidal technique of puncture with electrocoagulation of the hypophysis the authors present the findings in a series of 3 patients who succumbed at varying lengths of time after the procedure. The first patient died some 34 days after the procedure, and histological study showed destruction of about four-fifths of the adenohypophysis without involvement of the posterior lobe. In the second patient the necrosis lay chiefly in the pars intermedia. Little destruction of the adenohypophysis occurred. This patient died 21 days after the procedure. The third patient died after 5 days and showed somewhat similar findings.

In all of the patients the lesion was within the confines of the sella, thus confirming the roentgenographs taken at the time of placement. The authors have done many more of these procedures, approximately 25 on patients suffering from various malignancies. The incomplete destruction of the adenohypophysis would seem to mitigate against obtaining definitive results.

—*Nicholas Wetzel, M.D.*

Extradural Hematomas of the Cerebellar Fossa (Les hématomes extra-duraux de la fosse cérébelleuse). D. Petit-Dutaillis, G. Guiot, B. Pertuiset, and Y. Le Besnerais. *Presse méd.*, 1956, 64: 521.

The authors report 6 instances of extradural cerebellar hematomas seen at La Pitié and found 46 others reported in the literature. They believe that these lesions can be divided into four clinical types: the subacute, the acute, the chronic, and latent forms. The prognosis in a given instance would seem to depend upon the type and the time of intervention. The diagnosis is facilitated by simple skull films which have, in 80 per cent of the reported cases, shown a fracture of the posterior fossa; by ventricular puncture which may demonstrate an acute hydrocephalus; by ventriculography which may, especially in the subacute types, show a block of the aqueduct; and, finally, by carotid angiography which, if the venous circulation is demonstrated, may show a displacement of the torcular herophili.

In their series the clot was unrecognized until discovered at autopsy in 3 cases; another patient succumbed, although operated upon, because of a persisting aqueductal block; and 2 patients were cured by evacuation of the clot. The authors believe that early recognition and diagnosis of this condition is of greatest importance since it may be easily overlooked. Cerebellar signs are to be found most frequently only in the more chronic forms of the condition and not in the acutely ill patients. Hence, perhaps the condition should be suspected more often and appropriate measures instituted for diagnosis and treatment.

—*Nicholas Wetzel, M.D.*

The Endocrine Aspects of Craniopharyngiomas (Aspects endocriniens des craniopharyngiomes). Jacques Decourt, J. P. Michard, Bernard Weil, and J. Louchart. *Sem. hop. Paris*, 1956, 32: 767.

The authors present their recent studies of a series of 7 patients with craniopharyngioma. Six of these were operated upon. The study is primarily concerned, not with the surgical aspects of the disease, but rather with the endocrine aspects, which are thoroughly evaluated with a variety of modern methods. These include electroencephalograms, studies on various steroids, such as the 3-alpha steroids, 3 beta steroids, 3 phenol steroids, 11 oxysteroids, 17-ketosteroids, the corticoids, and 17–20 dehydroxy-ketosteroids. Thorne tests were done as well as basal metabolic and radioactive iodine uptake studies. The blood urea, cholesterol, calcium, phosphorus chloride, sodium, potassium, and protein were determined. Studies on body form were made as well as carbohydrate metabolism studies.

Significant alterations in many of these functions were noted. The authors discuss the evolution of the various types of endocrine disturbance and the factors pertaining to the outcome of the disease, particularly insofar as the response to surgery is concerned. They believe that the hazards of surgical intervention are considerably reduced by proper endocrine study and support, both prior to and after surgery.

—*Nicholas Wetzel, M.D.*

Meningiomas of the Lateral Ventricle (Meningiomi dei ventricoli laterali). F. Migliavacca. *Chirurgia*, Milano, 1955, 10: 249.

The author reviews 12 cases of meningiomas of the lateral ventricles from a clinical, neurological and surgical point of view and discusses the possibility of diagnosing these lesions by means of arteriography. According to Dandy, ventriculography is the only means of localizing meningiomas of the lateral ventricles but by cerebral, carotid, and vertebral angiography it is possible to obtain data concerning the exact location and type of lesion.

Following Cushing's classification, the author places the meningiomas of the lateral ventricle in two groups: meningiomas of the choroid plexus, and meningiomas of the lateral margin of the choroid tela.

The true plexus meningiomas are derived from the choroid plexus and, in most cases, from the choroid glomus. They develop completely in the ventricular cavity and, with the exception of the vascular peduncle, are found entirely in the ventricle. Sometimes they become psammomatous.

The authors describe the superior choroid tela, or velum interpositum, formed by a leptomeningeal fold,

which lies between the splenium of the corpus callosum and the corpora quadrigemina to form a triangular horizontal membrane with its base posterior and its apex anterior. Its superior surface lies on the inferior surface of the splenium of the corpus callosum and on the fornix. Its inferior surface rests upon the dorsal surface of the thalamus. Its central part lies on the roof of the third ventricle. Arteries and veins are found between the two layers of the tela.

In the plexus meningiomas, the choroidal vessels are situated at the inferior pole of the tumor. The author, like Cushing, differentiates the true meningiomas histologically from the meningiomas of the lateral margin and of the superior choroid tela, because the latter are highly fibroblastic, while the former have a tendency to be psammomatous. The meningiomas of the lateral ventricles (plexus meningiomas) or meningiomas of the lateral margin of the superior choroid tela have been found in the posterior central region of the cerebral hemisphere, near the ventricular trigone. Eleven of the author's cases were in this location. Only one was in the frontal region (anterior horn).

The symptoms were (a) intracranial hypertension and homolateral headache, (b) homonymous hemianopsia with macular sparing, (c) contralateral sensitive and motor hemiparesis, (d) cerebellar signs in 50 per cent, and (e) paralexia or alexia. According to the author the presence of calcification in skull films is not a specific sign of meningioma because cerebral neoplasms, such as ependymomas, oligodendrogliomas and craniopharyngiomas present micronodular calcifications.

Ventriculography gives precise data concerning the exact localization of a neoplasm, but does not help in recognizing its nature. The author states that only angiography can aid in the preoperative diagnosis of both localization and type. Age, sex, and duration of the disease are only of statistical value.

The prognosis of the lateral endoventricular meningiomas is good because they are benign tumors and relatively easy to remove. The residual neurological deficit varies according to the site of the meningioma, its size, and the operative technique employed. The most frequent localization is in the region of the trigone. The operative approach is through a parieto-occipital osteoplastic flap.

The author discusses 12 cases observed from 1930 to 1953 in the neurosurgical department of the general surgical clinic at the University of Milan, under Fasiani with brief notes on anamnesis, symptomatology, roentgenological and operative findings and histological reports. He does not present any ventriculographic findings because these are well known. The angiograms are described.

The 12 cases represent 2.81 per cent of all cranial meningiomas operated upon (426) and 35.4 per cent of the tumors in the lateral ventricle (31). Meningiomas are more frequent in women and in the third decade of age, with a duration ranging from 3 months to 9 years. In 6 of the cases there were manifestations of seizures. Contralateral hemiparesis was present in 10 cases. Cerebellar deficiency was present in 7 cases. In all of the cases intracranial hypertension and hemianopsia were present. In 2 cases roentgenograms of the skull showed calcification in the temporoparietal areas and in the choroid plexus. In 5 cases a cystic formation with xanthochromic fluid in the occipital region was found. In 7 cases plexus meningiomas were found in the superior choroid tela. Eight meningiomas were found on the right side and 4 on the left. In 6 cases the endoventricular localization of the tumor was demonstrated by ventriculography and in 1 case by electroencephalography. The other cases of meningiomas of the deep temporoparietal and temporoparieto-occipital regions were localized and diagnosed by carotid angiography.

The author reviews the angiographic findings and advises consideration of the following facts: In the intra-arterial phase or moment, with an anteroposterior projection, there may be a slight displacement posteriorly of the distal part of the anterior cerebral artery; this displacement suggests a neoplasm with extension into the ventricle. The carotid fork and the Sylvian group are not displaced. In the lateral projection the carotid syphon may be pushed forward and the anterior cerebral artery present a more or less evident enlargement of its pericallosal knee. The anterior choroid artery, which takes origin from the carotid siphon, appears more or less hypertrophic or serpiginous, and forms an abnormal circle with circumscribed edges, generally projecting toward the arc described by the displaced posterior temporal artery. In the venous phase there may be persistence of the area of abnormal vascularization. The vein of Galen loses its normal horizontal position and is lowered to form a curve with its concavity upward and slightly backward.

The author advises vertebral angiography if the carotid angiography shows a deep temporo-occipital tumor without showing a typical pathologic circulation. The anteroposterior projection is very important in revealing the round pathologic course of the anterior choroid artery, the position of the anterocerebral artery, and its slight displacement.

In conclusion, the author states that a typical symptomatology for meningiomas of the lateral ventricles does not exist except for the symptoms grouped by Cushing. Ventriculography remains as the elective method of localizing the ventricular tumor; carotid and vertebral angiography can give information regarding its type. —*Frank De Vincenzo, M.D.*

Tracheotomy in Severe Cranial Injuries (La trachéotomie dans les traumatismes graves). P. WERTHEIMER and J. DESCOTES. *Lyon chir.*, 1956, 51: 268.

FOLLOWING the lead of many American neurosurgeons during the past few years in the use of tracheotomy in the unconscious brain-injured patient, the authors have become impressed by the value of the procedure, having used it in 5 extremely seriously wounded patients, and they believe that the 2 patients who survived did so because of the effects of tracheotomy.

The collection of bronchial secretion and blood which may run down the throat from the epipharynx rapidly produces such dyspnea, hypercapnia, and anoxia, with a resulting heart load, that the patient cannot long survive under such a burden superimposed on the brain damage. Pulling the tongue forward, use of the "coma position", ordinary nasal and oral suction, and other such bedside measures will not

keep the airways clear enough to prevent the patient's drowning. An indwelling intratracheal tube is in itself a dangerous tool. Bronchoscopy is of short effect and cannot be often repeated. Cerebral venous engorgement follows the rapidly produced anoxia, to the end that an increased intracranial tension is added to the already present brain damage.

Tracheotomy, easily and quickly performed at the bedside, is considered the logical means of meeting this desperate situation, so well known to all neurosurgeons. By this procedure the useless dead space in the upper respiratory system is eliminated, and there is direct access to the lungs with the aspirating tube. Aspiration manually through the tracheal tube should be limited to very short sessions, no more than 4 or 5 seconds. The tube may be left in place with safety for 10 to 15 days, during which time feeding with a tube into the stomach through the nose or mouth is made much easier than were the tracheal tube not in place.

—*John Martin, M.D.*

Experiences with Prefrontal Lobotomy for Intractable Ulcerative Colitis; Preliminary Study. RICHARD W. LEVY, HARRY WILKINS, JESS D. HERRMANN, ACHILLES C. LISLE, JR., and ALVIN RIX. *J. Am. M. Ass.*, 1956, 160: 1277.

THE AUTHORS review their experiences with prefrontal lobotomies for intractable ulcerative colitis in a preliminary report. Five patients had varying degrees of obsessive-compulsive behavior, deep-seated hostility, and periods of depression, in addition to chronic ulcerative colitis of such long standing and severity that colectomy was deemed inadvisable. These patients were selected for lobotomy because both medical and psychiatric management had failed.

In 3 cases the effects on the colon were strikingly beneficial; the frequency of defecations became normal, and the patients gained weight. In the fourth case a second operation for more extensive division of the white matter produced only temporary benefits, and a colectomy undertaken as a last resort was followed by a fatal septicemia. In the fifth case, lobotomy was followed by the appearance of a voracious appetite, and intestinal obstruction with perforation ended in death a week later.

The indications for this operation were persistent bloody diarrhea despite intensive medical management, weight loss exceeding 25 per cent of the normal, and psychiatric symptoms that proved refractory to treatment. In 3 patients selected by these criteria, lobotomy was followed by complete remission of their colitis.

—*Joseph Ransohoff, M.D.*

Chorda Tympani Nerve Section for Postherpetic Neuralgia of the Tongue. EINO VAHERI and BERTEL GRAHNE. *Arch. Otolar.*, Chic., 1956, 63: 351.

THE AUTHORS discuss the concept of the nature of herpes zoster in the nervous system. They point out that involvement of the chorda tympani is fairly rare, and report 2 cases.

The first patient, a female of 66, awoke with a right facial paralysis. In the following few days headache and dizziness appeared with vesicles on the right side of the tongue, associated with pain on the right side of the tongue and in the right ear. The facial paralysis and dizziness left spontaneously, but severe pain persisted in the tongue, with radiation into the right ear. It was exaggerated by sour, salty, or spicy foods. Pressing the region of the tragus of the right ear precipitated lancinating pain in the right side of the tongue. She was treated first for an atypical trigeminal neuralgia, but alcohol injection into the gasserian ganglion gave no real relief. Subsequently, the pain returned in full severity and could again be elicited by pressing on the tragus. The area of the tongue supplied by the right chorda tympani was hyperesthetic, with diminished taste sensation. Hearing and function of the facial nerve were normal. Section of the chorda tympani was done according to the method of Rosen and was followed by complete relief of pain. The patient returned subsequently with pain in the posterior part of the tongue and pharynx on the right, considered to be of glossopharyngeal origin. The pain responded to stellate block.

The second case, a female of 36, is described, with onset of pain and vesicles on the right side of the tongue followed by pain in the same area. The patient felt as though the right side of the tongue had been burnt, and she could not eat any solid food. Sensation to pinprick was normal on both sides of the tongue. Sense of taste was normal for sweet, but sour and salt solutions along with alcohol caused sharp pain in the anterior two-thirds of the tongue, as did touch. Ear and facial function were normal. Section of the chorda tympani nerve by the Rosen method was performed with complete relief of pain. Following operation the sense of taste was completely absent for sweet, sour, and bitter in the involved area. Pain sensation was equal on both sides. Hearing was normal.

The authors believe that their cases support the opinion that the chorda tympani is composed not only of gustatory and secretory fibers, but also of fibers for sense of feeling to the anterior two-thirds of the tongue. They state that because of the presence of these fibers, a tic-like pain may develop in the area supplied by this nerve and that it may be completely relieved by section of the chorda tympani nerve. In discussing their conclusions, the authors briefly review the literature on the subject.

—*Edward B. Schlesinger, M.D.*

PERIPHERAL NERVES

Ganglionic Tumors of the Thoracic Sympathetic Trunk (Tumori gangliari del tronco toracico del simpatico). IVO NOVI. *Arch. ital. chir.*, 1955, 80: 233.

THREE INSTANCES of endothoracic sympathomas, representing 3 different stages of differentiation, are reported.

The first case was that of a 15 month old girl. For the past year the infant had exhibited difficulty in expiration and later this was accompanied by attacks of elevation of the body temperature (ranging up to 39 degrees C.), a baying cough, and moderate amounts of expectoration.

The roentgenologic examination disclosed a roundish shadow in the upper left lung field, protruding from the left mediastinal region, and there were other signs and symptoms of a space-occupying process in the upper left hemithorax. The shadow was about the

size of a hen's egg. The process had pushed the trachea toward the right and anteriorly.

The tumor was removed and on histologic examination proved to be a well encapsulated, easily removed, embryonic sympathoma with predominance of sympathogonic and sympathoblastic elements in the cellular picture.

The second case was that of a 17 month old boy. This child had bronchitis at 1 year and pertussis at 13 months. The dry persistent cough lingered and the roentgenologic examination disclosed hilar shadows on the right side which resembled an adenopathy; a later roentgenogram, however, disclosed increase in size of the shadows and the child continued to lose strength and weight. The shadow proved at operation to be an orange-sized tumor with infiltrative characteristics which rendered its removal difficult. Histologic examination of the removed specimen showed that it was an embryonic sympathoma with prevalence of sympathoblastic and ganglioblastic elements.

The third case was that of an 18 year old young woman who had suffered for approximately a year from a progressive loss of weight, asthenia, and anorexia. For some months she had had a dry cough. The roentgenologic examination disclosed a shadow in the left upper paramediastinal region, the size of a hen's egg, which was pushing the esophagus toward the right and causing a depression in its posterior wall. Transmitted pulsations were observed (opacification of the esophagus and stratigraphy).

At operation the tumor was found to fill the left costovertebral sulcus and, although well encapsulated, it was so adherent to the overlying parietal pleural as to require the removal of this covering together with the tumor itself.

Histologic examination of the removed specimen disclosed the presence of a mature sympathoma, that is, a tumor with prevalence of the more mature elements of the sympathogonic series.

In conclusion the author points out that in the embryology of the sympathic nervous system the sympathogonium represents a fundamental element which is still pluripotent and capable of evolving either in the direction of the mature, or immature, sympathetic cell, properly speaking, or toward a parasympathetic cell, the chromaffin cell. He believes that in the histogenetic sense the immature sympathoma cell represents an embryologic dysontogenesis and that the mature sympathoma cell represents a process of metaplasia of the more mature sympathogonium which is no longer able to multiply. Finally, he thinks that the evolution of the sympathogonium in the direction of the parasympathetic evolutionary direction represents an endocrinic type of histogenesis. —*John W. Brennan, M.D.*

SYMPATHETIC NERVES

The Anterior Transthoracic Approach for Upper Thoracic Sympathectomy. Louis T. Palumbo. *Arch. Surg.*, 1956, 72: 659.

The present article concerns a new upper anterior intercostal transpleural approach to the upper thoracic (dorsal) sympathetic chain, for sympathetic denervation of the upper extremities and/or heart, and its coronary vascular system is described.

Since April, 1953, this procedure was performed 27 times in 20 consecutive cases, and a complete sympathetic denervation of the upper extremity, head, neck, and upper anterior and posterior aspects of the chest was obtained, as well as a complete sympathetic denervation of all visceral efferent and afferent (pain) pathways to the heart.

This technique ensures a complete denervation, with greater ease of performance for the surgeon and with a minimal risk and a smoother postoperative convalescence for the patient. The cardiac patient with or without angina pectoris and/or coronary insufficiency withstands this procedure better, and the procedure is a safer one because of the position of the patient on the operating table. This technique does not interrupt the sympathetic pupillociliary pathways and, therefore, does not result in Horner's syndrome. These pathways apparently do not pass via the first thoracic ganglion into the lower portion of the stellate ganglion, as previously reported by others in the literature, and in various texts.

—*Joseph Ransohoff, M.D.*

SURGERY OF THE THORAX

CHEST WALL AND BREAST

Phyllode Tumor of the Breast (Constatazioni anatomo-cliniche in tema di tumore filloide della mammella). PASQUALE SCALFATI. *Policlinico, sez. prat.*, 1956, 63: 421.

A CASE of benign cystosarcoma phylloides located in the upper outer quadrant of the right breast of a 69 year old female is reported. The origin of the tumor is considered to be a pre-existing fibroadenoma characterized by its enormous size with overlying skin ulceration.

The tumor is rare and predominant in the female. It is very rare in the male. According to the author the treatment is surgical intervention.

—*Mariano Lopez-Belio, M.D.*

Surgical Treatment of the Inverted Nipple by the Technique of Skoog (Trattamento chirurgico del capezzolo rientrante secondo il metodo di Skoog). ENRICO BELTRAME. *Rass. ital. chir. med.*, 1955, 4: 711.

THE AUTHOR reports 3 cases (one bilateral) of inverted nipple in which the patients were treated surgically by Skoog's technique. Embryological and anatomical findings in this lesion are given. This anomaly is considered rare and hereditary and the author describes several surgical techniques for its correction (Kehrer, Bash, Alessandri, and Sellheim). This series of 3 cases is compared with Skoog's series previously reported in which there were 6 females with 4 bilateral conditions; all of the 6 were between 20 and 30 years of age.

Local anesthesia is preferred by Skoog, except when surgical intervention requires a long time in this sensitive area, in which case general anesthesia with pentothal is used. In the 3 cases reported by the author there was a successful recovery.

—*Mariano Lopez Belio, M.D.*

TRACHEA, LUNGS, AND PLEURA

The Surgical Treatment of Pulmonary Stenosis Under Direct Vision; Description of a New Technique and Presentation of the First Successfully Operated Case (Traitement de la sténose pulmonaire sous vision directe; description d'une technique nouvelle et présentation d'un premier cas opéré avec succès). NICOLAS OECONOMOS. *Presse méd.*, 1956, 64: 776.

THE AUTHOR, of the Athens (Greece) Polyclinic Center of Thoracic and Vascular Surgery, visited Henry Swan of Denver in 1954 and witnessed successful surgery (under hypothermia) under direct vision for cases of valvular stenosis. He was convinced that the best operative results follow intervention under direct vision, and set about seeking methods which would be simpler than that employed by Swan, Gross, and Donovan—who described either temporary shunts or total permanent shunts by means of vascular grafts or pumps.

The author set about overcoming two problems which blocked the preparation of a simple, artificial, temporary shunt, i.e., the preparation of a tube of suitable quality and caliber, and the prevention of coagulation of blood in the tube. The plastic material "Siloxan 300" proved to be satisfactory for the molding of tubes, and it functioned experimentally for 30 minutes without clot formation. Following successful pulmonary valvulotomy in 7 patients, the author describes his technique in the eighth case of his series.

The patient, aged 23, had cyanosis and dyspnea on exertion since the age of 2, with aggravation of his symptoms during the past year. The work-up made compatible a diagnosis of tetralogy of Fallot, with right ventricular hypertrophy and elevated pressure (148 mm. of Hg.).

A left anterior thoracotomy incision was made, with section of the third and fourth costal cartilages and an L-shaped incision was made into the pericardium with retraction of the cut edges to obtain optimal exposure of the right ventricle. The ventricle was greatly enlarged. An intense systolic thrill could be palpated over the pulmonary valve, and the stenotic area could readily be felt. The pulmonary artery above the stenosis was greatly dilated. After novocain infiltration of the myocardium, two purse-string sutures were placed, the first (with care) at the level of the infundibulum, and the second in the right ventricle at the site of the introduction of the inferior limb of the tube and held under tension. The tube had the diameter of a crayon, was sterilized in a mixture of "Siloxan-ether" by immersion for several hours, and was silicone-treated. An incision was made to introduce limb A of the tube, which was clamped temporarily at its midpoint. The pulmonary orifice was then prepared for the introduction of limb B of the plastic tube into the pulmonary artery at the level of the bifurcation; after insertion the tube was held in situ with a small Beck clamp. The shunt was now completed.

With the patient well oxygenated the clamping of the artery was tested a few times for exclusion of the segment and determination of satisfactory function of the shunt. A row of sutures was placed in the arterial segment and the artery rapidly incised. The stenosis was visualized and sectioned with pointed scissors. Dilatation was then accomplished and its adequacy was tested. Associated stenosis was checked for by insertion of the finger. The intracardiac operation now being concluded, the sutures were tied and the incision engaged in an arterial clamp. After a check on the excluded segment the clamp was slowly released. The plastic tube shunt was then removed and the defects were sutured. The pericardium was then repaired, a drain was placed in the pleural cavity and the thoracotomy incision was closed. The time for function of the shunt was 20 minutes, for the intra-arterial operation, 7 minutes, and for the entire operation, 3 hours.

Except for gastric dilatation the first postoperative day, which was relieved by siphonage, the patient's postoperative course was uneventful. The cyanosis and systolic thrill disappeared. Further improvements are being sought. —*Edwin J. Pulaski, M.D.*

Bilateral Bronchiectasis; Medical and Surgical Treatment; Experience in 61 Cases (Bronquiectasis bilaterales; tratamiento medico y quirurgico; experience en 61 casos. JORGE A. TAIANA and ALEJANDRO H. VILLEGAS. *Clin. tórax*, 1955, 7: 79.

THE AUTHORS analyze 61 cases of bilateral bronchiectasis studied at the Institute of Thoracic Surgery of Buenos Aires up to August, 1954.

The ages of the patients ranged between 4 and 57 years, with an average of 24 years. Twenty-eight patients were male and 33 female. The average duration of the disease in the group was 15 years. The fact that 43 patients had had previous respiratory diseases shows the importance of this factor in the pathogenesis of bronchiectasis. The disease predominated on the left side in 37 patients, and on the right side in 19, and was present on both sides in 5 patients. The lesions were most frequently found in the basal segments of the lung, in the inferior and middle lobes on the right and in the inferior and lingual lobes on the left.

The most important symptoms were mucopurulent bronchorrhea (100 per cent) acute bronchopneumonia (49.1 per cent), hemoptysis (47.5 per cent), sinusitis (40.9 per cent), clubbed fingers (31 per cent), and cor pulmonale (24.5 per cent). Twenty-one patients were treated medically and 40 underwent surgery (1943 to 1954). The 21 patients treated medically were cases with advanced disease, and a low pulmonary reserve, or they were in poor general condition. The medical treatment consisted of a hygienic and dietetic regimen, wide spectrum antibiotics, vitamins, blood transfusions, postural drainage, exercise, and periodic bronchial aspiration. Some patients were in the hospital and some were ambulatory. The criteria for evaluation of the results of medical treatment were the following: "cure" when there was freedom from bronchopulmonary symptoms or less than five mucous sputums a day and the patient was able to perform his normal activities (0 cases); "improved condition" when the symptoms were significantly decreased but still present in association with a good general condition (2 cases); "stabilized condition" when the disease had not progressed during treatment (11 cases); and "unfavorable result" when symptoms increased (7 cases).

The authors conclude that medical treatment is able to stabilize the condition and produce transient improvement in some patients. Of the 40 surgical patients 33 were operated upon on one side and 7 on both sides. Of the 33 operated upon on one side 16 were cured, 13 showed marked benefit, 1 presented tuberculosis as a complication, 2 died of sepsis, 5 and 11 months, respectively after surgery, and 1 died in the early days after the operation because of acute renal failure. In 7 cases in which bilateral operations were done, the average period between the operations was 20 months. The operations done in the entire series were as follows: 46 pulmonary resections, 5 segmental resections, 40 lobectomies (in 12 of which a segment was also extirpated), and 1 pneumonectomy. The authors consider that resection in cases of bilateral bronchiectasis should not be wide and extensive, but small because of the low pulmonary reserve of these patients and the possibility of surgical treatment on both sides.

The authors believe that the more diseased side should be operated upon first because if the patient is cured or significantly benefited, no further surgery is required. It is easier to manage the secretions of the other side with (Carlens-Bjork) double lumened tubes or with the patient in the prone position. In case of unexpected complications that contraindicate the second operation a good result will be obtained by resection of the more advanced suppuration process.

Among the 33 patients operated upon on one side the immediate postoperative complications were as follows: atelectasis in 11, bronchial dehiscence in 9, and empyema in 7. One patient died in the immediate postoperative period. Among the group of 7 patients with bilateral operations, 1 had atelectasis, 2 bronchial dehiscence, and 2 empyema. Two patients died in the immediate postoperative period.

Morbidity was less in the 22 patients operated upon in the prone position compared with the 24 operated upon in lateral decubitus. The total operative mortality was 7.5 per cent (3 cases) in 40 patients. Two other patients died long after the operation (5 and 11 months, respectively). Of the 3 operative deaths, 1 occurred on the fifth and 2 on the ninth postoperative days. The causes were atelectasis with bronchial fistula with bronchioalveolitis in one, acute respiratory insufficiency in one, and acute renal failure in one. Two of these patients belonged to the group operated upon on both sides and on 1 a resection noncompatible with life was done. —*Jose L. Bravo, M.D.*

Lipoid Granuloma of the Lung of Exogenous Origin. HOWARD A. BUECHNER and LAWRENCE H. STRUG. *Dis. Chest*, 1956, 29: 402.

ANY LIPOID SUBSTANCE aspirated into the lung may cause an acute or chronic pneumonitis or a chronic granuloma, depending on the frequency, the quantity, and the type of oil entering the lung. A specific etiologic clinical picture of lipoid pneumonia cannot be made. The lesions may be bilateral or unilateral. The key to diagnosis is an awareness of this condition and its consideration in the differential diagnosis of indeterminate pulmonary disease.

Studies of sputum specimens for oil content are valuable. A diagnosis can be made more easily in patients with bilateral lesions when a history of the habitual use of oily nose drops is obtained. The diagnosis is less certain in patients with a solitary circumscribed lesion, even with a history of the use of oily substances, and positive laboratory evidence of oil droplets in the sputum. In the latter cases, because circumscribed lipoid granulomatosis closely mimics carcinoma, exploratory thoracotomy and frozen section biopsy are mandatory. A localized area of oil granuloma can be cured by segmental resection or lobectomy.

—*B.G.P. Shafiroff, M.D.*

Aspergilloma of the Lung (Das Aspergillom der Lunge). W. HOEFFKEN. *Fortsch. Roentgenstrahl.*, 1956, 84: 397.

THE PATIENT was a 54 year old male who for 6 years had been suffering from a lesion in the apex of the right lung. For 5 years he had had a cough with a small amount of purulent expectoration. At intervals he had attacks of fever with night sweats and recurrent hemoptysis.

At the time of examination the pertinent blood findings consisted of an erythrocytic sedimentation time of 2/4 mm; i.e., it was markedly accelerated; the hemoglobin was 87 per cent, red cell count 4,400,000, the leucocytic count 16,300, with eosinophils 2 per cent, staff-cells 7 per cent, segment-cells 68 per cent, lymphocytes 22 per cent, and monocytes 1 per cent. The vital capacity was 3,700 and the respiratory border value was 31.5 liters; the oxygen saturation was 92 per cent. The sputum was negative for tuberculosis and fungi.

Most striking of the roentgenological findings were those obtained with tomography and with the bronchogram. Tomography revealed a homogeneous mass in the right upper lung field, lying loosely within a cavity with rather delicate walls. The pulmonary apex disclosed evidence of indurative processes. Bronchography revealed a partial filling of the cavity, and the delicate cystlike walls could be inflated. The draining bronchus, which was also shown by tomography, was somewhat enlarged cylindrically. The rest of the bronchial system was normal. With the aid of frontal exposures it was demonstrated that the lesion was located in the posterior, upper lobe segment of the right lung. In other words, the lesion had the characteristic findings of a pulmonary aspergilloma.

At operation the aspergilloma, together with its containing sac, was removed by means of a right upper lobectomy.

Microscopically, the walls of the cavity were made up almost exclusively of a lining of pseudostratified, ciliated cylindrical epithelium. Under this there were present, in addition to the submucous connective tissue, muscle fibers which tended to encircle the cavity. Scattered about were fragments of what seemed to be cartilaginous tissue. There were some small bronchial rami in the environs of the sac and these showed evidence of compression.

The content of the sac was composed of a mat of fungal mycelia, which under culture did not show any sign of the production of fructose, so that the organism could not be identified positively. However, the characteristics of the lesion were so typical that the author believes that there could be no doubt of its being an aspergilloma. Within the mycelian mass was an area which could be positively identified as actinomycosis; however, the author believes that the actinomyces were secondary invaders of the aspergilloma itself.

The author believes that the aspergilloma represented a secondary invasion of a preformed cavity in the lung. He did not think it possible that the preformed cavity could be a bronchiectatic dilatation because there was only one lesion and the rest of the bronchial system was perfectly normal. In other words, he believes that the contiguity of rather typical wall tissues and the well preserved lining cells (cylindrical, pseudostratified, ciliated) could mean only that the preformed cavity was a congenital lung cyst.

The reason that the lining epithelium did not show indications of pressure on the part of the mycelian mass is explained on the basis of the biologic characteristics of the fungus itself; that is, it was strictly aerobic and therefore could not grow to a size which would result in the blocking off of its own oxygen supply.

—John W. Brennan, M.D.

Primary Chondrosarcoma of the Lung (Il condrosarcoma primitivo del polmone). F. Cecconi. *Arch. ital. chir.*, 1955, 80: 219.

The author reports the case of a 32 year old man with pain in the left side of his chest and a nonproductive cough of 6 months' duration. Thoracotomy revealed a primary chondrosarcoma of the left lung, of which a biopsy was made and examined.

The histopathological classification of these tumors is discussed and 7 previously reported cases are reviewed. In 7 of the 8 cases the tumor was found in the left lung.

—George L. Nardi, M.D.

Decortication of the Lung. Paul Rudström and Lars Thorén. *Acta chir. scand.*, 1956, 110: 437.

Collections of fluid, pus, and blood in the pleural cavity ultimately become organized and form three layers. These are: (1) loose organization tissue, which is comparatively vascular, nearest the pleura; (2) connective tissue, relatively avascular, which forms the main layer; and (3) an inner layer consisting of necrotic tissue, fibrinoid masses, and detritus with or without bacteria.

In time the fibrotic component increases and the loose layer near the pleura diminishes and eventually disappears. Calcification may eventually occur. The fibrotic layer restricts the expansion of the lung and as the latter contracts marked deformity of the hemithorax is produced.

Many disfiguring operations have been devised in the past to cure chronic pleural empyema, which has been followed by the formation of layers as described. The operation of choice is decortication, which is done to prevent chest and spinal deformities and interference with the circulation and respiration, as well as to rid the patient of latent or manifest toxic or infective conditions.

The authors describe the standard operation of thoracotomy for decortication and their plan for management of the postoperative patient. There are no unusual features mentioned. The results are discussed. Of 19 patients, only 1 died. Great improvement was noted in all the others, the degree of improvement varying from patient to patient. Improvement in respiration was not borne out by pulmonary function studies, except for an increase in the maximum breathing capacity.

—Harold M. Unger, M.D.

HEART AND PERICARDIUM

A New Method of Treatment for Congenital Heart Disease Associated with Impaired Pulmonary Circulation; an Experimental Study. F. Robicsek, A. Temesvári, and R. L. Kádár. *Acta med. scand.*, 1956, 154: 151.

Congenital cardiac disease with involvement of the pulmonary vessels may be corrected physiologically by end-to-end anastomosis of the right branch of the pulmonary artery with the superior vena cava. This procedure is recommended in lieu of subclavian-pulmonary or aortopulmonary anastomosis in the presence of the tetralogy of Fallot.

The operation of pulmonary-vena caval anastomosis was tested experimentally in 15 dogs. The right

pulmonary artery and the superior vena cava were easily located and sutured end-to-end, thus by-passing any possible type of pulmonic stenosis. Four dogs died in the immediate postoperative period; the other 11 survived and were subjected to a variety of cardiopulmonary function tests 3 months later. At autopsy the veins of the superior vena cava were found to be slightly dilated, without demonstrable pathologic changes in the lung. The blood pressure in the superior vena cava and in the pulmonary artery was not significantly elevated above normal; oxygen saturation of systemic arterial blood averaged 95 per cent and pulmonary vascular resistance was not increased.

Technically, the operation is less difficult to perform than either that of Blalock or Potts because it permits an anastomosis without tension between two vessels of similar diameter with walls of equal thickness. Physiologically, this operation is more advantageous than the Blalock operation or its modifications because it places no burden on the right ventricle, reduces right ventricular work by 50 per cent, obviates a left to right shunt, and pumps pure venous blood to the lung. —*B.G.P. Shafiroff, M.D.*

Operative Closure of the Patent Ductus Arteriosus; a Report of 110 Operations Without Mortality. William W. L. Glenn, William E. Bloomer, and Harold C. Spear. *Ann. Surg.*, 1956, 143: 471.

The authors present in detail a total consecutive series of 110 operations on 108 patients with a patent ductus arteriosus. Either ligation or division of the ductus was performed, with no mortality.

Eleven per cent of the patients were 18 years of age or older. The female to male ratio was 3.5 to 1. Associated congenital cardiovascular defects were present in 22 patients; other congenital defects were found in 14 patients.

In the preoperative period, transient cyanotic episodes were noted in 13 patients, and cardiac failure occurred in 13 patients, 5 of whom required digitalization. Roentgen findings commonly included left or right ventricular hypertrophy and increased pulmonary vascular markings. Bacterial endocarditis was suspected preoperatively in 3 patients.

Cardiac catheterization was indicated in 36 patients in whom the diagnosis was doubtful. More than one-third of these patients showed a rise in right ventricular and pulmonary artery blood pressure. There was an increased oxygen saturation of the pulmonary artery as compared with the blood of the right ventricle.

In 14 operations (cases with large, thin-walled, friable vessels) controlled hypotension was used. A posterolateral incision, entering the pleural cavity through the fourth interspace, was most commonly utilized. The preferred technique was division of the ductus between Potts' clamps, with suture prior to division.

Operative complications included minor hemorrhage in 13 cases, and severe hemorrhage in 5 cases. Strips of autogenous fascia lata or nylon cloth were used to control hemorrhage from the aorta in 3 cases. Postoperative pleuropulmonary complications were noted 19 times in 17 patients. Other complications included stitch infection, thrombophlebitis, hyponatremia, and recurrent nerve paralysis. In 72 patients there were residual murmurs in the postoperative follow-up period. All patients but one received antibiotics. —*S. Lloyd Teitelman, M.D.*

The Diagnosis and Surgical Treatment of Tricuspid Valve Stenosis (Diagnostic et traitement chirurgical de la sténose tricuspidienne). Charles Dubost, Philippe Blondeau, and Gaston Ricordeau. *J. chir.*, Par., 1956, 72: 258.

Only 8 cases in which the operation of tricuspid valvulotomy was done are reported in the world literature. Another case of tricuspid valvulotomy, said to be the first published in France, is presented in detail. Although tricuspid lesions amount to approximately 10 per cent of all the valvular lesions seen in rheumatic heart disease, lesions of the tricuspid valve are seldom treated surgically because the commonly associated mitral valve lesion generally takes precedence, because the physiological disturbances following lesions of the tricuspid valve are far less pronounced than those following other valvular lesions, and because the tricuspid valve lesion is frequently a combination of insufficiency and stenosis.

The diagnosis of this condition depends on an alertness to clinical signs not adequately explained by mitral or aortic lesions. On physical examination signs of heart failure without evidence of pulmonary congestion are suggestive. The auscultatory, x-ray, electrocardiogram, and angiocardiogram findings that are helpful in establishing the diagnosis are reviewed. These methods may be quite inconclusive, but the technique of cardiac catheterization is an indispensable diagnostic aid. The studies will reveal a normal mean capillary and arterial pulmonary pressure in the absence of a significant mitral lesion and in the presence of a tricuspid valve lesion. A comparison of the pressures in the right auricle and ventricle will reveal an inversion of the customary gradient of pressure in the presence of tricuspid stenosis. Finally, direct study of the pressure tracings permits one to determine the possibility of a systolic regurgitation, and measurements of the cardiac output permit an approximation of the cross-sectional area of the valve. It is suggested that when mitral and tricuspid valve lesions are present the mitral lesion be treated first, and if the patient is in good condition the tricuspid valve lesion be operated upon during the same anesthesia. Of course, if at the conclusion of the mitral valvulotomy the patient's condition does not appear to be entirely satisfactory the attack on the tricuspid valve should be postponed to a second operation following in several weeks or months. For exposure of both valves a transverse anterior incision is recommended at the level of the third interspace or fourth rib, transecting the sternum in the line of a chevron through which both pleural cavities may be opened to reach the pericardium if both valves are to be explored.

The technical details of the operation of tricuspid valvulotomy are given, and in the previously published report 3 instances of mild regurgitation were noted at operation, but in 5 cases there was no regurgitation mentioned. The actual commissurotomy is similar to the operation on the mitral valve except

for the additional commissure. In the case reported two of the three commissures were reopened with a good clinical result. A metallic instrument is described, for splitting valves which do not admit a finger because of their severe degree of stenosis. The preoperative and postoperative care of these patients is similar to that in other types of heart surgery. The authors state that their patient obtained considerable functional improvement although he shared with the others whose cases were reported in the literature minor changes produced by x-rays, the electrocardiogram, and by hemodynamic studies. However, the functional result is the most important for the patient.

—Beujamin A. Barnes, M.D.

Certain Methods for Artificial Support of the Circulation During Open Intracardiac Surgery. CLARENCE DENNIS. *Surg. Clin. N. America*, 1956, 36: 423.

THE AUTHOR reviews the necessity of pump oxygenators for progress in the evolution of cardiovascular surgery. He acknowledges the pioneer work of Gibbon and Bjork, but explains how the "azygos principle" of Andreason and Watson have modified their earlier concept of maintaining normal volume flow and pressure relationships in the extracorporeal circuit.

Eight aspects of the development of a satisfactory apparatus to permit open cardiac surgery are outlined:

1. *Substitution for the lungs as well as the heart.* Attempts to establish an extracorporeal circuit which by-passes the heart but utilizes the subject's own lungs during cardiotomy have proved so cumbersome and discouraging that the need for an oxygenator is widely accepted.

2. *Adequate extracorporeal gas exchange.* Oxygenation and elimination of carbon dioxide are probably the only two important functions during the short interval of cardiotomy. Adequate gas exchange has been accomplished in four ways: (a) exposure of a flowing blood film to oxygen; (b) bubbling oxygen through blood; (c) perfusion through the isolated lung of an animal; and (d) perfusion of the subject's blood through another individual. Each method has inherent advantages and disadvantages. Exposure of a flowing blood film over rotating stainless steel mesh screens, 20 inches in diameter, each of which has an oxygenating capacity of saturating 500 milliliters per minute, has been used successfully by the author. Additional discs may be added to increase capacity. Bubble type oxygenators are efficient but require complicated devices to remove the bubbles and still present the potential hazard of gas embolization. Perfusion through the lung of a laboratory animal has been successful but requires extensive time-consuming manipulations and presents a theoretical danger of contamination. Utilizing a donor for cross circulation is thought to be safest, but subjects a normal second individual to undesirable risks.

3. *Efficient pumps.* The circuit must have a minimum of moving parts and maximal freedom from profound pressure and velocity gradients. Piston pumps cause excessive hemolysis. The characteristics of the various types of pumps are given. The author favors the Dale-Schuster apparatus which utilizes the principle of a flexible chamber activated by variable fluid, gas, or mechanical pressure; unidirectional valves activated by variable pressures are necessary; control of blood volume in the circuit is simple, automatic, and safe and hemolysis is minimal. The DeBakey pump utilizes rollers to compress a flexible tube but lacks a simple mechanism for control. Finger pumps develop flow by progressive co-ordinated compression of a flexible tube by mechanical fingers. The finger type pump and the DeBakey apparatus require no valves. Leland Clark and associates have developed a pump in which electronically controlled, variable gas pressure is applied to the blood in a closed chamber; directional valves are required. Karlson first suggested gravity flow from an elevated reservoir, which method, coupled with reduced flow allowed by the "azygos principle" and a single perfusion of blood from the reservoir, has been used clinically in infants. The useful interval is limited by the volume of blood required. A constant extracorporeal blood volume may be maintained by regulating either the arterial or venous side of the apparatus.

4. *Control of clotting.* Heparinization is used in all these circuits to prevent clotting and thrombin emboli or precipitate. Protamine is usually used to neutralize the heparin effect following completion of the perfusion. Decrease in platelets, loss of fibrinogen, and faulty clot formation or retraction have all been observed in blood after passage through all types of pump-oxygenators.

5. *Prevention of injury to formed elements of the blood.* Plasma hemoglobin concentration is the most accurate indication of formed element destruction. Levels up to 200 milligrams per cent are not damaging to the subject. Hemolysis is minimized by the utilization of non-wettable plastics, avoidance of abrupt changes in velocity or pressure, careful control of tubing diameter, insuring competence of valves and avoidance of pinch-cocks. Damage to formed elements has not been a serious problem in clinical work.

6. *Prevention of gas embolus.* Cerebral gas emboli are probably more dangerous than emboli to coronary arteries under the conditions existing during perfusion. There seems to be more danger of air being sucked into the apparatus due to lower than atmospheric pressure. Such relative vacuums have been eliminated by the author. Despite this, however, a bubble remover is necessary.

7. *Minimization of metabolic changes.* Changes in acid-base relationships during perfusion are due primarily to a variation in carbon dioxide tension. These may be minimized by regulation of carbon-dioxide content of the oxygenator atmosphere. The content of nonvolatile or fixed acids, such as pyruvic, increases during perfusion. This accumulation is inconsequential over short intervals provided that adequate volume flow of well oxygenated blood is maintained. Electrolytes or plasmaphoretic patterns are not appreciably altered.

8. *Hypothermia.* Hypothermia, to broaden the scope of perfusion, has been evaluated but superimposes new problems of cardiac arrhythmia. More investigation in this field is needed.

The author describes his apparatus and its use in detail. His pump-oxygenator has been used in 4 patients, 3 of whom were operated upon for intracardiac defects. He also relates the use of similar perfusion techniques by other workers and comments on the probable mortality rates following various intracardiac

operations performed during perfusion with an extracorporeal pump-oxygenator.

—*Luther M. Keith, Jr., M.D.*

Incarceration of the Heart Following Right Pneumonectomy. OLLE DAHLBACK and ERIC NILSSON. *Acta chir. scand.*, 1956, 110: 447.

AN UNUSUAL COMPLICATION of thoracic surgery is presented by these authors. Following a pneumonectomy for carcinoma of the lung, the patient became cyanotic in the operating room. The blood pressure disappeared and the pulse was not palpable. There was no apparent respiratory distress. The thorax was reopened and the cause of the syndrome was found to be a herniation of the entire heart through a rent in the pericardium and into the left hemithorax. The heart was replaced and the pericardium repaired. The patient had an uneventful postoperative course, but died soon after from cerebral metastases. —*Harold M. Unger, M.D.*

The Surgical Treatment of Aortic Stenosis. C. P. BAILEY, H. E. BOLTON, H. T. NICHOLS, W. L. JAMISON, and R. S. LITWAK. *J. Thorac. Surg.*, 1956, 31: 375.

THE AUTHORS present a lengthy review on the subject of aortic stenosis, and a summary of their personal experience with this condition. They discuss the surgical approaches to the correction of aortic stenosis alone and in combination with other valvular lesions.

Aortic stenosis may be due to congenital malformations, arteriosclerosis, fibrosis from bacterial endocarditis, or old rheumatic fever. In congenital stenosis, hypoplasia of the first portion of the aortic valve is associated with poststenotic dilatation. The presence of coarctation of the aorta has been noted in 42.7 per cent of reported cases, and frequently the association of mitral rheumatic disease with arteriosclerotic aortic valvular disease. Rheumatic aortic valvular disease is one-fifth as common as mitral valvular disease. Prolonged immobilization due to fibrosis and relatively high pressures at the aortic valve account for more frequent calcification. The occurrence of poststenotic dilatation is not infrequent.

The pathophysiology is related to the reduction in size of the orifice of the aortic valve with an increased velocity of blood leading to a prolongation of the "isometric" period of ventricular contraction. The left ventricle undergoes concentric hypertrophy without chamber enlargement until progressive failure of the heart leads to the typical bootlike appearance that is seen in the roentgenogram. The output must become less than 25 per cent for these changes to take place and, for this reason, most patients show no symptoms for a long time. The earliest symptoms are easy fatigability, exertional dyspnea, fainting spells, angina, and an abnormal electrocardiogram. Upon physical examination there is noted a short, harsh basal systolic murmur with or without a thrill which is maximal at the second anterior interspace just lateral to the sternal border. The aortic second sound is weak or absent; a long diastolic murmur at the base (Austin-Flint) may be mistaken for mitral insufficiency, but is due to aortic insufficiency. Atrial fibrillation should make one consider an associated mitral valvular lesion. X-ray examination is of little value until signs of failure have developed.

Multivalvular disease is frequently observed; 44 per cent of the patients considered here had significant mitral disease, and 17 per cent of those with mitral and aortic valve disease also had tricuspid disease. Isolated aortic stenosis follows a more malignant course than when it is associated with mitral stenosis. When both are present, surgery for one condition must take into consideration the other. The ideal method of measuring the degree of stenosis is by cardiac catheterization. Contraindications to surgical intervention include inadequate preparation of the patient, or progression toward a terminal state, significant regurgitant lesions of the mitral and aortic valve, and a very large heart suggestive of myocardial exhaustion. Preparation of the patient is similar to that for mitral surgery.

The indications, technical procedures, and results in the management of 287 cases of aortic stenosis are discussed. The authors conclude that the splitting of one or more fused commissures by simple finger pressure is possible in almost half the patients. The preferable approach is supravalvular, through the aorta, with use of a pericardial well. Coexisting mitral and tricuspid stenosis may be approached and relieved satisfactorily from the right side through the same right anterior thoracic incision. The use of a right-sided approach is compared with a left thoracotomy, and newer techniques are described at length.

—*Roger D. Williams, M.D.*

A Correlative Study of Valvular Morphology and Clinical Results in Aortic Commissurotomy. ROBERT S. LITWAK, JOSEPH F. URICCHIO, and WILLIAM LIKOFF *N. England J. M.*, 1956, 254: 781.

THE PRESENT STUDY was made in an attempt to define the relationship between the morphologic characteristics, at surgery, of the stenotic aortic valve (due to rheumatic fever), the operative results, and the final clinical results.

A series of 40 patients was studied. The study included an estimation at surgery of the degree of valve thickening and valve calcification, and the size of the aortic orifice before and after commissurotomy. In addition, the clinical manifestations were independently gauged preoperatively and postoperatively.

It was found that although all patients had some degree of valvular thickening and/or calcification, the combination of both these morphologic manifestations to a *marked* degree seriously hindered the efficacy of surgical enlargement of the narrowed aortic orifice. An immobile leaflet was found to be the most profound single deterrent to the likelihood of an adequate orifice.

Twenty per cent of the patients studied had heavily calcified, fixed aortic valves which negated the possibility of materially increasing the size of the orifice. An additional 10 per cent of patients have an advanced valvular disease which is insurmountable, bringing the risk of surgical failure to approximately 30 per cent. The authors believe that when this unfavorable situation exists, surgical intervention should be discouraged since 3 of the 4 operative deaths were in this group.

There was no consistent means of predicting preoperatively the existence of the morphologic type of

valve which precludes a satisfactory result. Clinical patterns were not consistent. Roentgenograms were helpful in identifying marked calcification, but did not demonstrate the 40 per cent of these patients who also possessed immobile leaflets.

A distinct correlation was found between clinical improvement and operative success in enlarging the stenotic valve. The authors found that significant benefit resulted when the area of orifice increased to at least twice the preoperative size, provided insufficiency was not produced (as occurred in 3 cases).

Four patients died at operation and an additional 7 died while under observation after surgery. Twenty-three of the remainder were improved, two were unchanged and four were made worse.

Finally it was considered that earlier operative intervention is the only logical approach to decrease the number of patients encountered who are morphologically inoperable. —*Arthur M. Simpson, M.D.*

ESOPHAGUS AND MEDIASTINUM

Contribution to the Pathogenesis and Therapy of Infantile Megaesophagus (Contributo alla patogenesi ed alla terapia del megaesofago infantile). CARLO MAURO. *Gior. ital. chir.*, 1955, 11: 1354.

THE PATIENT, a 6 year old boy born of healthy parents, developed persistent vomiting during an attack of whooping cough. Following recovery from the pertussis the vomiting persisted, and a ravenous thirst developed. Upon examination the patient exhibited such a serious physical condition that operation was deemed indicated.

The region of the terminal esophagus was exposed by the classic transpleural approach through the eighth costal interspace on the left side. The terminal esophagus was isolated to a point at some distance on the gastric cardia and upwards as far as the principal bronchi. Above the narrowed section of the terminal esophagus this structure was dilated to a diameter of approximately 6 centimeters, with extremely thick walls. The thin walls and atrophic musculature of the terminal esophagus seemed to exclude the esophagomyotomy of Heller, and recourse was had to the typical operation of Sweet. In this procedure the cardia is liberated from the phrenic hiatus and the entire thickness of the esophageal wall is split along its anterior surface from a few centimeters above the constricted section to the anterior wall of the cardia. The incision is then spread horizontally and closed with three rows of fine silk sutures. The first row closes the mucosa only, the knots lying in the esophageal lumen. The second row closes the muscular layer and the third row of U-sutures inverts the muscle layer and, in the stomach, the serous layer.

As a result of this procedure the esophago-cardial opening was enlarged to a diameter of approximately 2.5 centimeters. To ensure rest of the area operated upon, the left phrenic nerve was crushed. Under antibiotic treatment and suction drainage recovery was uneventful. For the first two days following operation the patient was given sweetened water (20 c.c. every hour), then milk in the same quantity; on the eighth day a normal liquid diet was instituted. On the fifteenth day the patient was discharged. A month later he had gained 6 pounds in weight. Preference was evidenced for liquids as food, but solid food could be tolerated when well chewed.

Some months later the roentgenographic examination disclosed an esophagus still increased in size but with good tonus and with peristaltic waves appearing in the upper portion. In the juxtacardial portion the opaque material continued to accumulate, but it was being rhythmically discharged in small amounts into the gastric cavity. —*John W. Brennan, M.D.*

The Treatment of Bleeding Esophageal Varices by Resection of the Lower Esophagus; Re-Establishment of Esophagogastric Continuity by Means of a Polyethylene Tube. MARVIN M. NACHLAS. *Arch. Surg.*, 1956, 72: 634.

THE AUTHOR presents 5 cases of cirrhosis of the liver, complicated by bleeding varices, in which esophagogastric resection of the varices has been performed. He discusses three methods which are commonly employed to reduce the bleeding: (1) a portal-systemic anastomosis, (2) transesophageal ligation of the varix, and (3) cardioesophageal resection. He has utilized Berman's method of restoring esophagogastric continuity by the use of a plastic tube. Berman had noted that such a tube becomes covered with a fibrous sheath that subsequently develops an epithelial lining, and the author uses this type of tube to bridge the defect of 3 to 10 centimeters created by the esophagocardiac resection.

Of the 5 patients in whom this procedure was performed for the control of massive hemorrhage, 3 have survived 9, 10 and 13 months, while 2 expired in the postoperative period. The thesis here presented indicates that it is usually accepted that 60 per cent of all cirrhotic patients with bleeding varices die during their first bleeding episode. Thus an operation is necessary which will control this bleeding and prevent further bleeding. Of the 5 patients, 4 had features of their disease which would have contraindicated a shunt procedure. The final evaluation of the esophageal resection and plastic tube prosthesis awaits a wider clinical trial. —*C. Barber Mueller, M.D.*

Contributions to the Study of Leiomyoma of the Esophagus (Contributo allo studio del leiomioma dell'esofago). L. DI DOMIZIO. *Ann. ital. chir.*, 1955, 32: 934.

THE AUTHOR reviews the literature of this relatively uncommon condition, leiomyoma of the esophagus, in considerable detail and discusses 2 personal cases. It is the most common benign tumor of the esophagus, but leiomyoma of the esophagus only accounts for from 5 to 6 per cent of the gut leiomyomas. It is most frequent in males in the fifth decade, although the age distribution is very wide. It is least common in the superior third, and most common in the inferior third of the esophagus. The pathogenesis is a matter for speculation. It may be a single, multiple, or diffuse myomatosis, and present according to its anatomic localization. The myomas have histological characteristics with some variability of their associated mesodermal constituents.

The symptomatology is variable with prominence of dysphagia and regurgitation. Hemorrhage is less

important than in the same disease of the stomach wall. Although radiology with contrast media and esophagoscopy may elucidate the diagnosis, there may be confusion with other benign or malignant conditions when the tumor does not present into the lumen. Surgical therapy aims at enucleation of the tumor rather than esophageal resection.

A copious bibliography covers most of the literature on the subject. —*Roger H.L. Wilson, M.D.*

Esophageal Reconstruction with Free Autogenous Dermal Grafts; an Experimental Study. RICHARD G. CONNAR, FRANKLIN H. CAMPBELL, and KENNETH L. PICKRELL. *Surgery*, 1956, 39: 459.

AFTER THE REMOVAL of split thickness skin from the abdomen of dogs, sheets of dermis were excised and defatted. A midline cervical incision was made and a segment of esophagus, 5 to 7 centimeters in length, was excised. The autograft of dermis was placed in the esophageal defect and fashioned into a tube, anastomosed above and below to the ends of the esophagus. In some of the dogs the procedure was varied by making reconstruction over a Berman plastic tube which was left in place following the operation.

Fourteen animals survived the operation. One dog died subsequently from perforation of the suture line by an ingested foreign body; 4 dogs died of starvation and pneumonia resulting from stricture at the junction of the graft with the distal esophagus; another dog died from perforation of the esophagus during antegrade esophageal dilatation, and one died from anesthesia for the same procedure.

Seven dogs survived and did well as long as repeated antegrade dilatation of the esophagus was done. When sacrificed, all were found to have a stricture at the junction of the graft with the distal esophagus. The stricture was not as marked as in the animals in which dilatation was not done. Use of the Berman tube did not alter the result as the tubes were all found to have passed into the stomach.

Evidence is offered to show that the dermal grafts survived. The method may be useful in reconstruction of the esophagus clinically in conjunction with some type of stent. Autogenous dermal grafts are less prone to infection than fascia lata and are stronger than split-thickness skin. Esophageal reconstruction may be preferable to esophagogastrectomy in the reduction of mortality and morbidity. —*Lockert B. Mason, M.D.*

Mediastinal Tumors and Cysts. N. RINGERTZ and S. O. LIDHOLM. *J. Thorac. Surg.*, 1956, 31: 458.

THE AUTHORS present a statistical survey of 155 pathologically verified primary mediastinal tumors and cysts seen at the Sabbatsberg Hospital during the period between 1944 and 1954. The findings are compared with previous reports in the literature. Tumors of the esophagus, metastatic tumors, intrathoracic goiter, and systemic and non-neoplastic processes were not included. Aberrant parathyroid adenomas and cysts of enterogenous origin were not noted, probably because children usually were not seen in that clinic. The use of roentgenography is stressed since 61 per cent of these tumors were discovered by this method.

The neurogenic type of tumor, both benign and malignant, was noted most frequently, and comprised 14.6 to 33 per cent of all mediastinal tumors in the present series. The benign tumor is invariably located at the costovertebral sulcus and grows close to the lateral surface of the columna and proximal part of the ribs. These tumors are always well encapsulated, vary from the size of a walnut to that of a large grapefruit, and are mostly solid. They are often connected with the sympathetic cord or spinal nerves. The x-ray picture of dilated foramina is an important diagnostic sign. The dominating tissue of all of these neurogenic tumors is neurofibromatous. The tumors grow slowly and often attain a considerable size without giving any symptoms. Of 52 patients, 49 were living 3 months to 11 years after operation, whereas the prognosis for the malignant tumors was extremely poor.

Fibromas and fibrosarcomas are comparatively rare in the mediastinum; chondromas, chondrosarcomas, leiomyomas and rhabdomyomas likewise are rare, although some cases have been reported.

Only 4 cases of angioma are presented in this series. All were located in the upper anterior mediastinum; none were encapsulated. Lymphangiomas seem to be slightly more common than hemangiomas; 7 cases were found. There is always some difficulty in differentiating mediastinal lymphangiomas from thymic cysts and pericardial cysts. Lymphangiomas grow slowly and are symptomless. Lymphosarcomas do not constitute a very large group among mediastinal neoplasms.

There is some controversy concerning the definition of thymoma, which is discussed, with the conclusion that thymomas associated with myasthenia gravis fall into a distinct group. Thymomas rank fifth most common of the mediastinal tumors and they are located predominantly in the upper anterior mediastinum. Grossly they show broad streaks of fibrous stroma surrounding islands of soft grayish-white tumor tissue. Microscopically lymphocytes and thymoepithelial cells predominate. Malignancy was noted in 4 out of 19 patients and 6 had myasthenia gravis. Thymic cysts are briefly discussed.

Teratomas of the mediastinum are second in frequency only to those of the gonads. They are the fourth most common mediastinal tumor—malignancy being noted in between 11.4 and 33.3 per cent of cases. In 11 of the 14 cases reported in this article, the tumor showed three germinal layers but only two were malignant. Two cases of bronchial adenomas and 6 cases of pericardial cysts are reported. The former have not been reported previously as tumors entirely separate from the trachea and bronchi; the latter were all located in the anterior inferior mediastinum, more frequently on the right. The finding of bronchial cysts unconnected with the tracheal bronchial tree supports the theory that bronchial cysts develop from a pulmonary anlage. —*Roger D. Williams, M.D.*

MISCELLANEOUS

Aberrant Intrathoracic Thymus Nodules (Noduli timici aberranti intratoracici). I. NOVI. *Arch. ital. chir.*, 1955, 80: 277.

A CASE OF INTRATHORACIC TUMOR adherent to the pericardium and in contact with the left pulmonary hilum is reported.

Histologically, the tumor mass is a lymphoepithelial formation of thymus structure and of bronchogenic nature.

The author reviews 6 similar cases reported in the medical literature. —*Mariano Lopez Belio, M.D.*

Conditions of Alveolar Ventilation in Intermittent Positive Pressure Respiration During Intrathoracic Operations (Die alveolaren Ventilationsverhaeltnisse bei intermittierender Ueberdruckbeatmung waehrend intrathorakaler Operationen). LOTHAR BARTH. *Thoraxchirurgie*, 1956, 3: 451.

THE AUTHOR discusses the problems associated with the different ventilation techniques employed with the development of thoracic surgery. In intermittent positive pressure ventilation, which is used at the present time, the positive intrabronchial pressure, which drops (under optimal conditions) to atmospheric level during expiration, causes rhythmic delay of the venous return. The actual decrease in venous return, in case the chest is open, diminishes the cardiac minute volume, which is occasionally associated with a fall in the blood pressure. Furthermore, carbon dioxide does accumulate unless an appreciably increased minute ventilation is maintained as compared with its level at rest (Bark and Stead). This holds true especially for the open thorax and has not as yet been sufficiently explained. As opposed to Stead, who believed that the increased dead space ventilation limited the carbon dioxide elimination, the author did not find any influence on such elimination to result from variations in the dead space volume.

The fact, hitherto unknown, that alveolar ventilation plays an important role in carbon dioxide elimination, which represents merely a mechanical problem of ventilation, was the basis for studies carried out on a series of patients ranging from 25 to 69 years of age. No special selection as to the patients was made. In all of them alveolar gas samples were drawn at different stages of intrathoracic operations, by means of a double lumen Carlens tube. Only the moments at which a major pulmonary vessel was ligated were avoided to prevent circulatory changes. In some of the patients, the gas volume exhaled during expiration was measured by means of the pneumothorax apparatus. Determination of the carbon dioxide content of the alveolar gas samples as well as of the exhaled air was achieved by following Haldane's method. The amount of carbon dioxide eliminated per unit time was calculated by the formula:

$$\text{total } CO_2 = \frac{V \text{ (volume measured)}}{100} \times CO_2\%.$$

In every instance the carbon dioxide values in the healthy lung were elevated, whereas in the partially collapsed lung, exposed to the operating field, the carbon dioxide was diminished, which indicated that ventilation of the diseased lung was more efficient than ventilation of the healthy lung. These results do not depend on the position of the patient, as could be proved by determination in the lateral position as well as in the Overholt position. Minute ventilation and carbon dioxide elimination were usually found to be higher than one would expect in relation to the underlying disease, when compared with the healthy lung.

Since breathing resistance in the Carlens tube can be discounted, as it is about equally high in both tubes (according to Gaensler), ventilating and circulatory differences due to postural conditions (Hirdes) are not consistent with the open thorax, and recent investigations on changes in the pulmonary circulation during intrathoracic operations failed to show any difference between the two sides, the results herein presented can be explained by unilateral increase in ventilation following thoracotomy. With retraction of the involved lung after opening of the pleural space, there is a decrease of the residual air in relationship to the breathing capacity, as there is a decrease in volume of the dead space. Furthermore, since there is no other resistance against passive insufflation than the elastic lung tissue, which amounts to less than 10 cm. of water, the ventilation and carbon dioxide elimination improves, provided there is no bronchial obstruction or decrease in functional alveolar surface or elasticity of the lung. Therefore, curarization rather than decreased ventilation should be employed to provide a quiet operating field. Ligation of the pulmonary artery prior to transsection of the bronchi impairs the function of the healthy lung, as after having been excluded from the circulation the ventilated lung represents an enormous dead space which cannot be compensated for by hyperventilation.

The author emphasizes the role of unilateral ventilating changes in carbon dioxide elimination following thoracotomy, the observation of which will contribute to further improvement and avoidance of complications in anesthesia. —*Erwin Simandl, M.D.*

SURGERY OF THE ABDOMEN

GASTROINTESTINAL TRACT

The Surgery of Carcinoma of the Esophagus, the Cardia, and the Upper Part of the Stomach Under Neurovegetative Suppression (Die Chirurgie von Carcinomen des Oesophagus, der Kardia, und des oberen Magenteiles unter neurovegetativer Daempfung). A. BENZER, W. CAITHAML, A. GROSZSCHEDL, and H. STOLZER. *Langenbecks Arch. u. Deut. Zschr. Chir.*, 1956, 281: 342.

THE PECULIAR ASPECTS of surgery in the region of the esophagus, cardia, and upper part of the stomach are determined by the nature of the disease itself and the age of the patient concerned. The thorax and abdomen must be opened. There is general atrophy of the viscera, lowered over-all vitality, and resistance to stress. There is loss of elasticity of the vessels with ready dilatation and poor venous return to the heart. Left ventricular atrophy and coronary impairment make for poor circulation. The bony thorax is rigid and respiratory excursion is poor. The bronchial tree is stiff. There is reduced vital capacity and inefficient gaseous exchange. The kidneys do not concentrate and dilute well. Nourishment is interfered with and there is usually a negative nitrogen balance. The blood volume is depressed and the electrolytes need adjustment. The malignancy causes temperature rise, hypochromic anemia, and bone marrow depression.

The opening of the two body cavities causes cooling of the body with resultant compensatory rise in the metabolism. Cutting of the diaphragm further interferes with respiration. Handling of the heart and aorta causes reflex changes in the circulation.

The author discusses refinements in the technique of hibernation as used by Laborit and Huguenard. The disadvantages of the chlorpromazine cocktail are discussed. Because of the sedative effects of the chlorpromazine the patients are not co-operative postoperatively. An unusual rise in temperature occurs after the drug is stopped. The pulse rate is very irregular. The urine volume is sharply reduced. The fluid and electrolyte balance is difficult to achieve. Postoperative complications are easily obscured.

These disadvantages induced the authors to substitute hydergin for the chlorpromazine. They use a combination of hydergin, panthesin, sandosten, promethazin, and piridosal instead of Laborit's melange. This mixture of drugs produces general sedation, adrenolysis, vagolysis, glycogen storage, antihistaminic effects, and bradycardia. Its use in 43 patients with carcinoma of the esophagus, cardia, and upper stomach is described, and a detailed table of dosage and time relative to operation is given (Table I). The disadvantages listed above are not found to occur under this regime. —*Max L. Smith, M.D.*

Atypical Tuberculosis in Gastroenterocolitic Form (Les tuberculoses atypiques à formes gastro-entérocolitiques). ANDRÉ JACQUELIN and JEAN DUHAMEL. *Sem. hôp. Paris*, 1956, 32: 1240.

THE AUTHORS believe that in a number of cases of chronic enterocolitis not responding to any medication or diet the underlying cause is an atypical tuberculosis, and that the gastrointestinal symptoms should be considered as an allergic reaction against the tubercle bacillus. They observed about 20 pertinent cases for many years and describe 3 of these in greater detail.

These cases are characterized by an extremely chronic course, often for decades, with negative roentgenologic and bacteriologic findings and an extremely strong local reaction after intradermal tuberculin injection in high dilution. They had been treated unsuccessfully for years under various diagnoses (chronic hepatosis, terminal ileitis, infectious enterocolitis, chronic appendicitis).

One of the cases has been observed for a period of 30 years by one of the authors. The patient had had an attack of erythema nodosum at the age of 12 and of pleurisy at the age of 13. From that time on, for more

TABLE I.—PLAN FOR NEUROVEGETATIVE SUPPRESSION

Time	*Dosage*	*Action*
a. Preparation for 3 days.....	Hydergin 0.3 mgm. i.m. b.i.d.	General sedation, bradycardia, glycogen storage in liver, adrenolysis
b. Evening before surgery.....	In addition to a. Hydergin 0.3 mgm. i.m., sandosten 50 mgm. orally, or phenobarbital 0.1 gm.	Adrenolysis, vagolysis, antihistaminic effect, sedation
c. Day of operation: 2 hrs. pre-op. in 3 half hourly l.m. injections.....	Hydergin 0.9–1.2 mgm., sandosten 50 mgm. or promethazin[1] 50 mgm., piridosal 100 mgm. panthesin 250 mgm. (5 c.c. 5 per cent sol.)[2]	Sympathicolytic, antihistaminic, vagolytic, sedation, cardiac effect
d. Continuous drip infusion consisting of anesthesia and operation begins.....	Hydergin 0.6–1.2 mgm., sandosten 50 mgm. or promethazin[1], panthesin 250–300 mgm., piridosal 100 mgm., dextrose 5 per cent sol. 500 c.c.	
Duration of infusion: 3 hrs. (when operation is shorter the remainder given postop.)		
e. Evening of day of surgery....	Same as c.	
The following morning.....	In the usual infusion: hydergin 0.3 mgm., sandosten 50 mgm., panthesin 250 mgm.	
g. That evening.....	Same as f. given intramuscularly	

1. Sandosten and promethazin to be given alternately. The first is more vagolytic, the latter has a stronger antihistaminic effect.
2. Only when thrombosis or cardiac risk exist, especially the sensitive patients.

than 20 years, she had a chronic condition of gastrointestinal disturbances with frequent episodes of epigastric pains, vomiting, diarrheas, and weight loss. All laboratory tests, including chest roentgenograms and sputum examination, were always negative. She was more or less an invalid because of chronic diarrhea. Twenty years after the onset of the gastrointestinal symptoms the authors treated her with a series of old tuberculin injections. This therapy gave, for the first time, relief of the gastrointestinal paroxysms, the patient gained weight, and was free of symptoms for several years. During the war and under the influence of extremely poor nutrition the symptoms recurred and an open lung tuberculosis developed, to which the patient succumbed at the age of 65 years.

The second patient presented a history of intractable chronic enteritis with frequent episodes of fever, abdominal pains, and diarrhea which were observed for a period of 17 years. All of the laboratory tests and clinical examinations were always negative but an intradermal tuberculin test with a dilution of 1 to 100,000 was intensively positive and provoked a severe diarrhea 48 hours after the injection and the local reaction was still visible after 6 weeks. A repeated intradermal test with the same dilution some time later had the identical result.

The third patient had a similar history of chronic colitis without any clinical or laboratory findings for a period of 17 years. At this time injection of 0.5 mgm. of tuberculin produced an enormous local reaction, the size of a palm, and an attack of diarrhea and nausea. Tuberculin therapy for a period of 14 weeks resulted, for the first time in this long history, in relief from the gastrointestinal symptoms and a gain in weight.

The authors state that they observed about 20 similar cases in which a latent tuberculosis seemed to have caused chronic enterocolitis of very long duration in the sense of an allergic reaction. The treatment is discussed at length. Although isoniazide and gold therapy was used in several of the patients, tuberculin therapy proved more effective than any other treatment. —*Werner M. Solmitz, M.D.*

The Syndrome of Misdirected Parasympathicotonia (Das Syndrom der fehlgeleiteten Parasympathikotonie). P. Bsteh. *Klin. Med.*, Wien., 1956, 11: 145.

The author discusses a syndrome which he terms "misdirected parasympathicotonia." This syndrome results from hypoglycemia which leads to overstimulation of the parasympathetic (PS) system and may in many cases play a role in the pathogenesis of peptic ulcer.

It has been observed that peptic ulcer and diabetes occur very rarely in the same patient; they virtually exclude each other. This observation led the author to the question of a possible connection between hypoglycemia and peptic ulcer. In animal experiments hypoglycemia was induced by insulin injection; this causes irritation of the vagus nerve and may produce ulcers of the stomach and intestine. Similar observations indicating a connection between hypoglycemia and peptic ulcer have been made in man.

The physiology of the carbohydrate metabolism and the influence of adrenocortical hormone and of the stress syndrome on hypoglycemia is discussed. The most important "outlet" for the hypertonic parasympathetic system is sleep; and in parasympathetic hypertonia the need for sleep is markedly increased. Other manifestations of parasympathetic hypertonia are: vasomotor rhinitis, asthma, angina pectoris, esosinophilia, and others. If the outlet of sleep is blocked for some reason or other the "syndrome" of misdirected parasympathicotonia will result. It is noteworthy in this connection that, according to one writer, peptic ulcer is eight times as frequent in men working during the night than in those working during daylight hours.

The therapy of the syndrome consists in a combination of adrenocortical hormone (cortisone or ACTH) with high doses of sugar and sodium bicarbonate. At the same time the sleep mechanism should be regulated to break the vicious cycle. This is accomplished not only by barbiturates and other drugs but sleep is induced by conditioned reflexes to avoid the untoward side effects of drugs. This "conditioned reflex therapy" has been developed especially by Russian authors and is little mentioned in the Western literature. It includes thermophors, noise machines, green lights, and music.

This interesting article should be studied in the original. —*Werner M. Solmitz, M.D.*

Perforated Acute and Chronic Peptic Ulcer; Conservative Treatment. Hermon Taylor and R. P. Warren. *Lancet*, Lond., 1956, 1: 397.

The authors have made a follow-up study of the 99 cases of acute and chronic peptic ulcers reported ten years ago by one of the authors, and of 101 cases added since that time. The difference in behavior between perforations of acute ulcers and perforations of chronic ulcers is stressed, their differentiation being made entirely on the basis of the presence or absence of a history of dyspepsia previous to the perforation.

The mortality, complications, and disability are confined almost entirely to the chronic ulcer group. The mortality among 143 patients in this group who were treated by simple suture was 14 per cent. The authors suggest that subtotal gastrectomy might be the treatment of choice in these cases.

In the group with acute ulcer there were no fatalities among those treated by aspiration; neither were there any fatalities in another group treated by simple suture. However, of 47 patients treated by aspiration, only 3 have had a recurrence of ulcer symptoms and none has come to operation. In contrast to this are the results published regarding the group treated by simple suture. In this group, approximately 25 per cent suffered a recurrence of symptoms and half of these required operation.

With these facts in mind, the authors suggest a policy which sets forth the treatment of acute perforations by gastric aspiration, and of chronic perforations by partial gastrectomy if there are no contraindications to this. —*John J. Bergan, M.D.*

Metabolic Derangements Imperiling the Perforated Ulcer Patient; the Plan of Therapy. Oliver Cope and Anne Wight. *Arch. Surg.*, 1956, 72: 571.

The mortality rate from the perforation of peptic ulcers has been high, and despite modern treatment

continues so, unremittingly. The authors relate this to metabolic derangements manifested by these patients. An improvement in the mortality rate could be expected from better fluid, electrolyte and nutritional management. Vigorous plasma therapy immediately after admission, with prompt restoration of plasma volume, should do much to efface the time-honored rule that the longer the time between perforation of the ulcer and the operative procedure, the higher the mortality.

The authors have adopted an organized plan of management which assumes that simple closure of the ulcer will be employed. The therapy is designed to correct deficiencies present on admission, buffer the additional burden of the operation, anticipate continuing loss and subsequent resorption of fluid into the area of peritonitis, and finally satisfy the nutritional needs of the convalescence. The substances used are water, colloids, electrolytes and nutritional elements.

Fluid volume required. The patient with a perforated peptic ulcer becomes dehydrated in several ways: seepage of fluid into the interstitial tissues of the peritoneum, urinary excretion, gastric drainage, sweat, respiratory water loss, and blood loss at operation. The loss into the peritoneal tissues may be extensive and the management is analogous to that of a burn patient. To keep pace with leakage of plasma fluid, the therapy must be intense in the early hours, and slackening as interstitial tissue pressure increases and brings further collection of edema to a halt. An estimate of insensible loss under basal conditions in the patient with a perforated peptic ulcer is 1.6 kilograms on the day after perforation, 1.4, 1.2, and 1.0 kilograms on the three subsequent days, and 0.8 kilograms a day thereafter.

Colloid requirement. The concentration of protein in the free peritoneal fluid of patients with perforated ulcer closely approximates that found in bleb fluid of cutaneous burns (4.5 grams per 100 cubic centimeters). This is replaced by administering 700 to 1,200 cubic centimeters of a mixture of 80 per cent plasma—20 per cent electrolyte solution during the first 24 hours.

Electrolyte needs. Potassium needs are met by administering 75 mEq. (2.9 grams) of potassium a day.

Nutritional needs. Since parenteral fat preparations are not sufficiently free of reactions, dependence is placed upon carbohydrates and nitrogen. A 10 per cent dextrose solution supplemented with amino acid hydrolysates of 20 grams daily is routinely used in the preoperative and postoperative period. Urinary excretion has been found to be the most sensitive indicator of adequacy of fluid therapy during edema formation in the ulcer patient. If therapy fails to keep pace with the plasma loss, renal blood flow diminishes and urinary output falls. Intravenous fluid infusion should be started as soon as the diagnosis of a perforation is made, and continued throughout the whole phase of edema formation, for shock is impending as long as plasma is being lost from the circulation. Frequent and accurate weighing of the patient is an additional and valuable guide to the state of hydration of the patient. Until oral feedings are well re-established, nutritional supplements should be given by vein.

—Lloyd D. MacLean, M.D.

Results of 5 Years of "Selective" Treatment of Perforated Ulcers (Résultats de cinq ans de traitement "éclectique" des ulcères perforés). J. MIALARET, G. EDELMANN, R. PILLOIS, R. BOURGEOIS, and J. BRIZON. *Sem. hôp. Paris, Ann. chir.*, 1956, 32: 97.

OPINIONS as to the proper treatment of perforated ulcer differ. The authors present and attempt to justify the treatment that they have used in the past 5 years in a series of 70 cases of perforated ulcer. To begin with, it is stressed that there is no routine method for the treatment of perforated ulcer. Each patient must receive the treatment that for him represents a minimum of risk and a maximun chance of cure, not only of the perforation but also of the ulcer. Following preparatory treatment with aspiration for 3 hours, some patients are operated upon immediately, that is, if the diagnosis is doubtful, if the patient cannot tolerate aspiration, and if no clinical improvement has been noted. Suture is reserved for cases in which resection is contraindicated. Operation is performed also in cases with a prolonged history suggesting that gastrectomy will eventually be necessary. However, nonsurgical treatment is tried in young patients with a recent or short history, in patients in poor general condition, and in patients in whom the perforation has already been obliterated.

It is stressed that careful and constant observation is imperative in patients receiving nonsurgical treatment. Many failures are due not to the method but to its faulty application. Roentgen examination following lipiodol ingestion is recommended to determine the exact location of the perforated ulcer.

The conduct of nonsurgical treatment is discussed in detail. It includes continuous gastric aspiration, the suppression of fluids by mouth, the injection of antibiotics, parenteral nutrition, and constant observation of the patient and the aspiration.

Gastric aspiration is preceded by evacuation of the stomach through a Faucher tube which may in itself cause spontaneously obliterated perforations to reopen, but greatly facilitates aspiration. The condition of the duodenal tube must be carefully checked. Aspiration is discontinued only for x-ray examinations and is continued for 48 hours. Fluids by mouth are withheld for 2 days, and are well tolerated if enough are administered parenterally. Thirst can be allayed by increasing the latter. On the third day aspiration is discontinued for one-half hour each hour and the patient is allowed a drink. On the fourth day the tube is removed and the patient is allowed to drink when he wishes. On the fifth and sixth days the patient is given liquid food and on the seventh day semisolid food, with return to a normal diet on the eighth day.

For 8 days streptomycin and penicillin are given in combination, in daily doses of 1 gr. and 1,000,000 units, respectively, by intramuscular injection. Adequate parenteral administration of fluid is insured by the intravenous injection of 2 liters of serum (glucose ⅔, saline ⅓) as long as aspiration is continued. Blood, plasma, or other fluids are used only if indicated by laboratory findings. Absolute checking control and observation of the aspiration are imperative.

Once these preliminary measures have been undertaken, it is preferable to let the patient rest under observation for 4 hours, when renewed examination is

in order to determine the choice of treatment. If there is no pain and the patient is calm or asleep, the course will probably be favorable. If spontaneous pain persists or recurs shortly and the patient is restless, operation is indicated.

The significance of contracture is more difficult to evaluate and the contracture may persist after spontaneous pain has subsided. It diminished definitely in only 20 per cent of the cases; should it increase or grow worse operation is indicated. In doubtful cases a repeated roentgen examination may be justifiable. Laboratory findings do not influence the choice of treatment nor the appearance or amount of the aspirated fluid.

If it is decided to go ahead with aspiration, the latter must be checked every half hour by the nurse and the patient should be seen every 4 hours by the surgeon. At any sign of exacerbation of the symptoms with recurrence of spontaneous pain or increase of the contracture, operation is indicated. A frequently observed sign of failure of aspiration is early painful generalized or localized distention, which in 2 cases in the present series was taken as an indication for intervention. Painful tension of the abdomen on palpation may persist for 24 hours or more in the subhepatic region without dangerous significance. In most cases local and general improvement go together. If not, it is better to operate.

After the first 24 hours observation is directed chiefly to aspiration and re-equilibration, and examination of the patient two or three times a day will suffice. In the majority of cases standard re-equilibration will suffice. Excessive diuresis suggests too rapid or too copious infusion. An azotemia of 0.80 to 0.90 by the third day does not necessarily have adverse prognostic significance. A temperature of 39 degrees up to the third day does not necessarily indicate a residual collection. However, persistence or recurrence after the fourth or fifth day, when the temperature has usually returned to normal, should suggest the possibility of a subphrenic or pelvic suppuration, or a pulmonary complication. Distention around the forty-eighth hour, contrary to early distention, is not dangerous if other symptoms are favorable. The spontaneous emission of gas suggests a favorable course. It is warned that injections of prostigmine or rectal lavage with hypertonic saline solution will interfere with correct recognition of re-established evacuation. Mistakes in indications and technique are discussed, as well as difficulties arising because of inadequate observation of the patient, over-treatment, excessive duration of aspiration, and the significance of roentgen findings following the ingestion of lipiodol.

In the series of 70 cases treated according to the principles outlined, there were no deaths. It is emphasized that abstention, intervention, suture, and gastrectomy all have their indications.

—*Edith Schanche Moore*

Cancer of the Stomach (Cancro do estômago). E. Lima Basto, F. Gentil Martins, and Ayres Kopke. *Arq. pat.*, 1954: 26: 401.

Of 1,730 patients received at the Portuguese Oncologic Institute during the period from 1949 to 1953, 437 were diagnosed as having gastric cancer. Of this last number, 21 had been operated upon elsewhere and 27 had not returned to the Institute after the first examination. This left 389 patients who remained under observation and it is on this last group that this study is based.

In this material hereditary factors were not prominent (3.8 per cent). There was a slight predominance of male patients, 58.9 per cent being males. The vast majority of the patients were between 50 and 70 years of age. As to blood group incidence, group A blood was found to be moderately predominant. The other factors of diagnostic significance were found to be either too few in number to be of statistical significance, or they did not differ essentially from those usually encountered in the medical literature.

Of the 389 patients, 58 refused operation and 71 presented a condition which contraindicated operation. Of the 260 patients on whom operation was done 130 were subjected to only palliative operations or exploratory laparotomies. The remaining 130 patients underwent total or partial gastric resection. For these 130 there was a mortality rate of 6.9 per cent.

The authors hope that the operative mortality can be decreased (5 of the 9 deaths occurred during one year, 1949). It is still too early to evaluate the ultimate survival. This much, however, is obvious, viz., that the percentage of inoperability at the time of making the diagnosis is discouragingly high. Failure to obtain an earlier diagnosis is ascribed by the authors to the fact that the condition itself is partly to blame, in that it lacks characteristic early symptoms. Further improvement in the results must be expected from a more intensive education of the public and of the medical profession itself.

Once the diagnosis has been established, the authors insist upon laparotomy whenever possible, even though the preoperative clinical and roentgenologic examination might suggest that the case is inoperable, and once the abdomen has been opened, they insist on doing gastric resection even though it be done only in a palliative sense. In fact, in a considerable number of cases the authors have obtained surprising periods of survival in patients who by previous standards would have been adjudged inoperable. The amplitude of the exeresis is determined by the degree of gastric invasion and by the involvement of the lymphatic nodes. On the whole, the authors consider that 6 cm. from the furthest edge of the neoplastic mass are sufficient to guarantee some feeling of safety with regard to extension by contiguity; they more or less restrict the employment of total gastrectomy. The enlargement of the regional lymph nodes need not necessarily indicate a poor prognosis, since in many instances these swellings are purely inflammatory in nature.

—*John W. Brennan, M.D.*

Late Hemorrhages After Gastric Resection (Les hémorragies des suites éloignées de la gastrectomie). J. Lebon and R. Claude. *Presse méd.*, 1956, 64: 430.

Some hemorrhages occur immediately after gastric resection and these must be treated by medical procedures; they are, therefore, not discussed in this article.

Tardy hemorrhages are more serious and have various causes with difficult problems of diagnosis. The

most important point with regard to these hemorrhages is their prevention, and for this reason the first operation must be done correctly.

The cause of these hemorrhages is difficult to discover, the most frequent one being anastomotic ulcer, followed by gastrojejunitis, mucous hernia, and cancer of the resected stomach.

ULCERATIVE DISEASE

All of the complications are not listed under the name of anastomotic ulcer because this lesion is not the only cause of ulcerous hemorrhages.

Anastomotic ulcer

Sharp pain is one of the most important symptoms of anastomotic ulcer, and seems very unusual to the patient. X-ray examination shows the ulcer to be over the first inches of the jejunum. Sometimes this ulcer is perforated into the colon and the fistula can be seen.

Anastomotic ulcer complicated by hemorrhage should be immediately treated by surgery.

Other localizations of the ulcer

Anastomotic ulcer is not the only kind of recurrence of the peptic ulcer; sometimes another peptic ulcer develops over the lesser curvature and causes hemorrhage. The cause of this recurrence is still not clear.

X-ray interpretation is very difficult because adhesions of the previous operation involve part of the stomach and produce false niches on the roentgenogram. One of these false niches is caused by the fact that during the Finsterer gastrectomy one suspends the duodenojejunal angle very high to the gastric section to prevent the return of fluids to the duodenum. These ulcers could be treated by medical procedures.

In some cases, the hemorrhage is caused by the fact that the removal of the ulcerative lesion has been impossible during the first operation and therefore has not been done. Reoperation on these types of lesions is very difficult and frequently impossible.

GASTROJEJUNITIS

This complication is one of the most frequent causes of hemorrhage. In most cases it is not painful and preliminary symptoms do not appear.

We can presume that hemorrhages without pain belong to this group, as anastomotic ulcer is painful.

Sometimes gastric mucosa is burned by acids and this causes the hemorrhage. This type of hemorrhage is irritated by acid foods and controlled with alkalies. Symptoms from gastrojejunitis are irregularly periodical, occurring every 2 or 3 weeks. X-ray examination is not of great value, but gastroscopy is very helpful. In gastroscopic examination one can recognize various pathologic signs, i.e., gastritis, stomatitis, or jejunitis.

Bleeding in these complications must be treated by medical methods. Surgical operations are limited to the rare cases in which the previous gastrectomy has not been done correctly or the inabsorbable sutures are not eliminated; these operations are always dangerous and difficult.

MUCOSAL HERNIA

Mucosal hernia is divided into three groups: intussusception of the gastric mucosa through the jejunum, passage of the jejunal mucosa into the stomach (mucosal hernia is detectable by x-ray examination and gastroscopy), and hernia through the diaphragmatic passage of the esophagus. This kind of hernia is more frequent after gastrectomy than in other cases. X-rays are the best means of diagnosing the condition, and its radical treatment consists of surgery.

PRIMARY CANCERS

Primary cancers of the resected stomach are very rare and are ordinarily recognized after long periods of anemia. —*M. T. Ghavamian, M.D.*

Total Gastrectomy for Large Gastric Carcinoid (Gastrectomia total por carcinóide volumoso do estômago). NELSON DE SÁ EARP. *Rev. brasil. cirurg.*, 1956, 31: 35.

THE AUTHOR discusses the problems arising in the treatment of carcinoma of the stomach. He believes that in many cases, total gastrectomy may solve the existent problems, much as radical mastectomy with excision of the internal mammary chain has done in mammary carcinoma.

However, certain problems obtain in performing total gastrectomy. From the abdominal approach, it is difficult to anastomose the esophagus and frequently fatal peritonitis ensues in the postoperative period. When the thoracic approach is used, increased morbidity is a postoperative consequence.

The author quotes extensively from I. Boerema, who points out the same difficulties and further presents his method of performing a supradiaphragmatic esophagointestinal anastomosis from the abdomen, which method he has used for 10 years. Boerema emphasizes the totality of the operation, and the need for removing all of the gastrocolic ligament, the lymphatics of the lesser curvature of the stomach (which are in the lesser omentum), a considerable portion of the esophagus and the duodenum, the spleen, the tail of the pancreas, and all of the retroperitoneal tissue between the pancreas and the esophageal hiatus.

Boerema states that he utilizes total gastrectomy routinely in the treatment of gastric carcinoma. Only when hepatic metastases, ascites, or retropancreatic nodes are found is cure hopeless. In these cases subtotal gastrectomy is done to relieve pain from partial obstruction, or anemia from constant blood loss from the superficial tumor.

Boerema then describes his device, much like a Murphy button, which is used for making the esophagointestinal anastomosis. This device is later removed by way of the mouth for use in other cases.

The author cites a case in which the Boerema device was used. A huge tumor was removed which with the spleen, stomach, the attached lymph nodes, and adherent tissue weighed 2300 grams. The operation went well but on removal of the Boerema device on the twelfth postoperative day, wound disruption occurred. Secondary closure was effected and the patient left the hospital on the twentieth postoperative day. The histologic report was gastric carcinoid.

Numerous illustrations show the device of Boerema and the extent of resection suggested by him. Photographs of the patient and the preoperative and postoperative roentgenograms are shown.

—*John J. Bergan, M.D.*

The Re-Establishment of the Continuity of the Digestive Tract After Total Gastrectomy (Le rétablissement de la continuité digestive après gastrectomie totale). J. GOVAERTS, A. VAN WIEN, and M. COLARD. *Acta gastroenter. belg.*, 1956, 19: 105.

THE AUTHORS express considerable concern over the reported complications following total gastrectomy. These are discussed under the headings of dysphagia, a loss of digestive capacity and the "dumping syndrome", diarrhea, problems related to inadequate absorption, loss of weight, and severe anemia. Various technical methods of restoring gastrointestinal tract continuity are considered. The Hoffman or Roux type of esophagojejunostomy is thought to produce the functional disorders mentioned. Esophagoduodenostomies when feasible are thought to be somewhat more advantageous. In view of the impossibility of applying this technique to all cases, various plastic procedures are presented for re-establishing the continuity between the esophagus and the duodenum. The transverse colon transplant and the ileocolic transplant are briefly discussed. The former provides an antiperistaltic communication between the esophagus and the duodenum, whereas the latter, by rotating the cecum upward with the ascending colon, permits the terminal ileum to be sutured to the lower esophagus and provides an isoperistaltic communication between the esophagus and the duodenum. Various techniques for employing a transplant of the upper jejunum brought through a rent in the transverse mesocolon are presented, and the esophagojejunostomy may be an end-to-end or an end-to-side anastomosis.

The authors present 8 personal cases in which continuity of the gastrointestinal tract following total gastrectomy for cancer was achieved with plastic procedures in which the jejunum was used as suggested by F. A. Henley. Two deaths occurred in this series because of an acute hemorrhagic pancreatitis and a cerebrovascular accident. There were no anastomotic leakages, and in the 5 patients who survived the immediate postoperative period there was no dysphagia or significant limitation in the capacity of the alimentary tract. Two of the patients developed a transient diarrhea. One patient lost approximately 15 pounds in weight, although the remaining 4 patients gained approximately 7 pounds on the average. It is emphasized that the technique used for the esophagojejunostomy was an end-to-end suture in one layer with sutures approximately 3 to 4 mm. apart. The authors collected 45 cases from the literature of various plastic procedures with a combined total operative mortality of 17.7 per cent. In the 33 patients who survived these plastic procedures to connect the esophagus and duodenum the results were described as excellent in 89.1 per cent. —*Benjamin A. Barnes, M.D.*

Anemias Following Total Gastrectomy; Attempts at Prophylaxis and Therapy (Die Anaemien nach totaler Gastrektomie; Versuche zur Prophylaxe und Behandlung). O. RAINER and S. ZOLLNER. *Langenbecks Arch. u. Deut. Zschr. Chir.*, 1956, 281: 371.

AFTER TOTAL gastric resection nutrition is affected by the loss of two functions of the stomach, namely, storage and digestion. The gastrectomized patient lacks hydrochloric acid, gastric enzymes, mucus, and antianemic factors. Trypsin must take over the task of pepsin to split the polypeptides. The bacterial flora of the large intestines invades the small intestines in gastrectomized individuals and replaces the acidophilus bacillus. Such changes of the intestinal flora may lead to fermentative processes and also to secondary lesions of the liver. Three types of anemia as sequelae of total gastric resection may be differentiated: (1) iron deficiency anemia, (2) pernicious anemia, and (3) conditions resembling aregenerative anemia. Many mixed forms may also be observed.

The anemia problem was studied by the author in 59 patients on whom total gastrectomy had been performed within a 5 year period. Probably because of the prophylactic administration of vitamin B_{12} pernicious anemia developed in only 1 patient 3 years and 5 months after the operation. The parenteral administration of vitamin B_{12} is preferable to oral administration because the colon bacilli in the jejunum destroy the ingested product.

Absence of the stomach has no direct influence on the resorption of iron as the latter takes place predominantly in the duodenum and jejunum. The presence of free hydrochloric acid is not absolutely necessary for the ionization of ingested iron. The authors were able to show that in the presence of occult or mainfest sideropenia, iron gluconate is sufficiently absorbed by gastrectomized patients.

Postoperative jejunitis, which may develop not only after total but also after partial gastrectomy, causes repeated small hemorrhages. The resulting iron deficiency may lead to aregenerative anemia.

Epithelial changes accompanying iron deficiency anemia, such as glossitis, pharyngitis, changes of the nails, and the so-called Plummer-Vinson syndrome, resemble the clinical picture of B_2 complex hypovitaminosis. The impairment of absorption and utilization of vitamins after total gastrectomy, combined with intensified decomposition by the changed intestinal flora, has polyhypovitaminosis as its sequel. In view of the fact that the vitamin B_2 complex activates free hydrogen, which is necessary for the ionization of ingested iron, such vitamin deficiencies affect the iron metabolism. It follows that the prophylactic use of the vitamin B_2 complex is advisable.

Routine administration of vitamin B_{12} constantly prevented disturbances of the ripening of megalocytes. Iron deficiency anemia was favorably influenced by the oral administration of iron gluconate. The presence of atrophic changes in the small intestines was combated by the intravenous administration of iron saccharate. Vitamins C and B_2 were prescribed for the prevention of hypovitaminosis.

—*Joseph K. Narat, M.D.*

Primary Malignant Neoplasms of the Duodenum Excluding the Papilla of Vater; a Clinicopathologic Study of 31 Cases. ARTHUR BURGERMAN, ARCHIE H. BAGGENSTOSS, and JAMES C. CAIN. *Gastroenterology*, 1956 30: 421.

PRIMARY MALIGNANT NEOPLASMS of the duodenum, excluding the papilla of Vater, are rare. Thirty-one cases were found at autopsy at the Mayo Clinic from 1910 through 1953, an incidence of 0.12 per cent. Twenty-seven of the 31 tumors were adenocarci-

nomas; the remaining 4 were sarcomas of various types. There was no evidence in this series that a benign ulcer had undergone neoplastic change. Metastasis had occurred in 20 of the 31 cases. The commonest sites of metastasis were the regional lymph nodes and the liver.

The commonest clinical features in this series were pain, loss of weight, vomiting, and anemia. Melena, jaundice, and an abdominal mass were also prominent findings. A lesion was found by roentgenologic examination in 15 of 22 cases. In no case was a correct diagnosis made without positive roentgenologic evidence of the lesion.

Methods of Therapy in Diverticulitis. CLAUDE E. WELCH and GRANT V. RODKEY. *Surgery*, 1956, 39: 712.

IN RECENT YEARS surgical therapy has emerged as the optional treatment for diverticulitis of the colon. The authors discuss the surgical indications and procedures in the various types of lesions commonly encountered.

Uncomplicated diverticulitis was an indication for operation in approximately 30 per cent of the authors' cases. Repeated attacks of the disease, symptoms appearing before the age of 50, or the development of urinary symptoms during an acute exacerbation were the reasons for operation in this group. Here the operative method of choice is a one-stage resection of the involved area and anastomosis. The mobilization of the colon must be carried to a point where essentially normal bowel can be used for the anastomosis.

When perforation is a complication, the choice of operation depends on the type of perforation present. Small peridiverticular abscesses or encapsulated mesenteric abscesses can usually be excised in toto together with the sigmoid, and do not contraindicate a one-stage resection and anastomosis. Larger abscesses which must be drained at the time of operation may involve contamination of the peritoneal cavity. They introduce an extra hazard and make immediate anastomosis unwise. Closure of the perforation, local drainage, and a defunctioning transverse colostomy are best.

Hemorrhage, while occurring in perhaps 15 per cent of cases, is nearly always small in amount and therefore rarely a cause of emergency operation. Major hemorrhage is preferably treated conservatively during the acute episode. Operation is performed only if bleeding continues at a rapid rate despite replacement therapy. If operation is carried out, the preferred treatment is resection of the segment involved with immediate anastomosis.

Acute complete obstruction in the absence of perforation is uncommon. Consequently, when acute obstruction occurs, there usually is a palpable mass due to local perforation and abscess formation. A transverse colostomy should be made in the right upper quadrant. Presence of the mass nearly always arouses the suspicion of cancer, so that resection of the sigmoid should be planned after an interval of 10 days to 4 weeks unless it resolves rapidly. Much more common is subacute obstruction in which episodes of short, but more acute, obstruction occur. They tend to subside rapidly on bed rest, sedation, and sulfathalidine. Consequently, such patients usually can be prepared within a few days for a one-stage resection and anastomosis.

Differentiation between diverticulitis and carcinoma is frequently difficult. No attempt should be made to differentiate the lesions until the patient is prepared for a bowel resection. At that time the lesion can be grossly and microscopically examined by the pathologist, and the type and extent of surgery determined by his findings.

Diverticula of all other portions of the colon except the cecum are treated, as are the lesions of the sigmoid. Cecal diverticula are best treated by local excision, with a mortality of 1.6 per cent, rather than by resection with a mortality of 7.3 per cent.

Among 187 resections for diverticula during the past 13 years, there were 5 deaths. Two were related directly to the operation with dehiscence of an anastomosis and peritonitis. The other 3 were due to coronary or pulmonary complications.

At the present time routine subtotal colectomy or wide resection designed to remove every diverticulum visualized by roentgenogram does not appear to be justified. —*Ely Elliott Lazarus, M.D.*

Severe Forms of Hemorrhagic Ulcerative Colitis—Indications for Primary Surgical Treatment (Les formes graves de la recto-colite hémorragique "colite ulcérative"—les indications du premier traitement chirurgical). A. LAMBLING and J. J. BERNIER. *Sem. hôp. Paris*, 1956, 32: 53.

THE AUTHORS believe that ulcerative colitis has been rare in France but frequent in the United States.

French physicians did not see any necessity for the radical treatment of this disease before World War II, but after this war a type of ulcerative colitis similar to that seen in America, was seen in France.

Many of these cases are very serious and fatal, and surgery is the only treatment.

The authors recognize three types of ulcerative colitis: (1) acute febrile with continuous evolution, (2) subacute forms with successive crises, and (3) long chronic types.

The authors report 2 cases of the first type.

The first one was a serious case with continuous evolution, subfebrile at the beginning and highly febrile later. This process involved the whole length of the colon in less than 10 months. Ileostomy was performed, but the wound did not heal and was fatal, perhaps because of hypalbuminemia and hypokalemia.

The second case was also serious with toxemia. After 10 weeks of continuous evolution of the disease it was necessary to perform an immediate ileostomy.

The disease recurred 2 months later and a total colectomy was done 6 months after the first operation.

The authors reported 2 cases of the subacute type.

The first one occurred in a 49 year old man, who died after a series of successive crises. The last crisis occurred 5 years and 6 months after the first 2, and after 4 months of evolution resulted in the death of the patient. The second was that of a 22 year old girl with lesions extending to the ileum and a serious alteration of the proteinemia, who after ileostomy and total rectocolectomy recovered.

Of the long chronic type of condition 2 cases are reported. The first was that of a 37 year old woman on whom a total rectocolectomy was done. The general condition of the patient was seriously altered by the local complications (stenosis, perirectal suppurations, and hemorrhage) of the disease.

The authors believe that malignant transformation of ulcerative colitis is very rare. In the United States this transformation has been considered more frequent, because the pseudopolypoid form is confused with diffuse polypoadenomatous colitis which often becomes malignant. The authors believe that x-ray examination does not always show the exact extension and severity of the lesions and the surgical decision must ordinarily be based upon the evolution of the disease, its effect on the general behavior of the patient, and failure of medical treatment.

Hypoproteinemia is always the first sign of danger and shows the necessity for surgery, but hypalbuminemia is of more importance. Hydroelectrolytic disturbances are another important sign of danger and show the sensitivity of the patient to the surgical operation.

Fungoid antibiotics must not be used in this disease because they destroy all the bacteria in the intestines and produce a great imbalance of the electrolytes. Cortisone is not advisable.

Ileostomy, which is the first stage of the next colectomy, is always dangerous, because the immediate change it brings in the absorption and metabolism of the hydroelectrolytes of the body. Two or 3 weeks after ileostomy, the colectomy must be performed. Ileostomy does not cure the disease by itself and must always be followed by total rectocolectomy.

By means of these operations it has been proved that the colon is not necessary for life.

The authors believe that the abdominal ileostomy is better than anal ileostomy and its control by the patient is easier. Patients with ulcerative colitis accept ordinary surgical treatment because of their special mentality. —*M. T. Ghavamian, M.D.*

Intestinal Obstruction Due to Gallstones. CARL G. MORLOCK, EVERETT SHOCKET, and WILLIAM H. REMINE. *Gastroenterology*, 1956, 30: 462.

SIX CASES of intestinal obstruction due to gallstones are reported from the Mayo Clinic. Nineteen such instances had been recognized and reported from the same institution prior to 1952. The authors speculate that gallstones probably migrate into the intestine much more frequently than is commonly supposed. According to one report in the literature, in a single period during which 176 cholecystenteric fistulas were encountered, only 10 cases of intestinal obstruction were noted. Of the 6 patients considered in the present report, 2 experienced spontaneous relief after the usual nonsurgical therapy for definitive intestinal obstruction. In one of these a large bowel movement was passed on the seventh hospital day and the stone was identified by an alert nurse; in the other, unexplained symptoms were improving with parenteral hydration and intestinal suction when repeated digital rectal examination yielded the stone from the rectal ampulla.

The value of rectal examination is further emphasized by the authors. In 2 additional instances an extrarectal hard mass (the cholelith) was felt on hospital admission. In one of these patients the condition was accurately diagnosed, and roentgenograms demonstrated a 4 centimeter oval density in the pelvis and air in the biliary tract. The patient's critical condition, however, never improved sufficiently to permit surgery. Autopsy revealed a cholecystenteric fistula and a cholelith impacted in the distal ileum. The other patient, in whom the stone was palpated per rectum and visualized in the roentgenogram, was successfully treated by surgical removal of the cholelith and cholcystectomy.

An elderly physician with the clinical picture of pyloric obstruction and in whom an obstructing duodenal mass was demonstrated roentgenologically, was found to have a cholelith, 4 centimeters in diameter, impacted in the duodenum. Cholecystectomy and removal of the stone through the fistula proved efficacious.

An obese 300 pound woman with persistent obstruction was explored on the tenth hospital day. An obstructing cholelith was removed from the distal ileum, with uneventful recovery. The patient's massive obesity militated against further surgery.

Diastasic Perforations of the Colon (Les perforations diastasiques du côlon). GASTON-CLAUDE SIMON and MÉTAIRIE-SIMON. *Acta gastroenter. belg.*, 1956, 19: 192.

THE TERM "diastasic perforation" used by the authors means a perforation due to extreme distention of a portion of the colon proximal to a partial or complete obstruction. In most cases this obstruction is caused by a carcinoma of the colon, most frequently in the sigmoid or rectal area. The perforation is usually located at the anterior wall of the cecum or ascending colon, although it has been observed in other portions of the colon. In most cases the perforation is extremely small and difficult to visualize at laparotomy. It may be hidden by an edema of the intestinal wall of by a false membrane. Larger tears, of more than 1 cm. in length, are rare.

The sequelae vary as they depend on the size of the perforation and on the content of the colon. If the tear is very small and the colon contains much gas and little liquid a pneumoperitoneum develops gradually within a few days without true peritonitis or peritoneal exudate. If the tear is larger and fecal material seeps into the peritoneal space a purulent peritonitis develops rapidly.

The pathogenesis and mechanism are discussed. Overdistention of the colon proximally to an obstruction will occur only if the ileocecal valve closes tightly and bars any reflux of the intestinal contents and gas into the ileum. In the majority of cases the valve can be forced open by increased intracolic pressure and in these cases no perforation will occur.

Three theories have been advanced for the genesis of the perforation: infection, mechanical tear, and ischemia due to the distention. The authors believe that in most cases all three factors may play a role.

The diagnosis is difficult. Most cases come to operation under the diagnosis of an obstruction, and the perforation is discovered at surgery only. X-ray examination is the most important help in visualizing the pneumoperitoneum and establishing the diagnosis.

The prognosis is poor and the mortality high doubtless because most of the patients are operated on at an advanced stage only.

The authors of this article observed 5 pertinent cases which are reported in detail. In 4 of them the obstruction was caused by a carcinoma and in 1 case by a volvulus of the right colon. Only 2 of the patients survived. —*Werner M. Solmitz, M.D.*

Carcinoma of the Right Side of the Colon; Operability, Resectability, and Survival Rates. GEORGE D. J. GRIFFIN, EDWARD S. JUDD, and ROBERT P. GAGE. *Ann. Surg.*, 1956, 143: 330.

THE PRESENT REPORT is concerned with a comparison of two series of cases. The records of all surgically treated patients with carcinoma of the right side of the colon seen at the Mayo Clinic from 1939 through 1948 were studied and compared with previously reported records of similar patients seen from 1907 to 1938, inclusive.

The over-all resectability rates increased from 67.0 to 77.1 per cent in the later series (and to 85.9 per cent among those treated in 1952), because of the increasing use of palliative resection. The 5-year survival rate among those in whom resection was performed as a curative procedure in the 1939-1948 series was 60.4 per cent of those surviving the operation (surgical mortality, 6.5 per cent). This survival is compared to 57 per cent for the 1907-1938 group in which the hospital mortality rate was 23.5 per cent. While the percentage of 5-year survivals is not appreciably greater in the later group than in the earlier one, it was believed that because of the difference in hospital mortality rates (and perhaps in the operability rates) more patients survive carcinoma of the right portion of the colon at present than did prior to 1939.

Perhaps the major change in technique between these periods was the acceptance of the one-stage radical hemicolectomy, made possible through advances in the adjuncts to surgical care, as the procedure of choice in all cases in which cure was the object, and in many cases operated upon for palliation.

—*David T. Petty, M.D.*

Carcinoma of the Colon and Rectum; a Study of 353 Cases with Special Reference to Prognosis. SV. OSNES. *Acta chir. scand.*, 1956, 110: 378.

THE RESULTS obtained in the surgical treatment of 195 patients with carcinoma of the colon and 158 patients with carcinoma of the rectum, from 1932 to 1953 inclusive, are reviewed. The operability rate has continued to increase while the operative mortality has decreased. The latter improvement is due to better preoperative and postoperative care and to the use of antibiotics, fluid, and blood infusions.

The 5-year survival rate for patients undergoing radical surgery was 54.8 per cent for those with carcinoma of the colon and 33.3 per cent for those with carcinoma of the rectum.

The prognosis was better for carcinoma of the right colon than of the left colon, and better for proximal rectal lesions than for distal ones. The macroscopic appearance of the tumors and the presence or absence of metastases were of great prognostic value. In both the colon and the rectum the prognosis was better for large than for small tumors. Small tumors were more frequently associated with lymphatic metastases.

—*Ernest D. Bloomenthal, M.D.*

The Surgical Treatment of Hemorrhoids. A. G. PARKS. *Brit. J. Surg.*, 1956, 43: 337.

THE AUTHOR describes a detailed anatomic investigation of the anorectal hemorrhoid-bearing area. The mucosal attachment previously thought to be due to the insertion of an anal intramuscular septum has been shown to be due to a fibromuscular ligament connecting the mucosa of the anal crypts to the fibrous tissue on the internal sphincter. The subcutaneous external sphincter is a relatively trivial muscle ring. It is the author's feeling that the true cause of hemorrhoids is to be found in the venous occlusion during prolonged pelvic straining. On theoretical grounds, the author believes that the superior hemorrhoidal artery should be ligated above the anorectal ring.

The author describes a method for submucosal resection of hemorrhoids with high ligation of the superior hemorrhoidal artery. The procedure has the advantages that there is little loss of mucosa, and postoperative pain is minimal. —*Alan Thal, M.D.*

The Noble Operation; the Problem of Peritoneal Adhesions (La operacion de Noble; el problema de las adherencias peritoneales). JOSÉ A. PIQUINELA. *An. Fac. med.*, Montev., 1955, 40: 109.

THE AUTHOR presents the rationale of the Noble operation devised to control the formation of postoperative adhesions. This operation consists of the folding of the small bowel and placing continuous sutures between the serosal surfaces of the affected bowel loops. The procedure does not prevent adhesion formation but controls the place and location of the newly formed adhesions and thereby prevents future episodes of intestinal obstruction. The Noble operation has been used in cases of intestinal obstruction due to adhesions, and as a prophylactic measure after an abdominal operation when denuded and ragged areas were present on the serosal surface of the small bowel. The operation should be performed on patients in whom the obstructive episode has subsided; if it is done during acute obstruction decompression should be done before the folding surgical procedure.

The author emphasizes some technical aspects. He considers that all denuded surface on the bowel should be included in the folding procedure. The size of the folds should be 15 to 20 cm., and a continuous suture should be used instead of interrupted stitches to prevent the formation of holes between the loops when the bowel distends. The continuous suture can be placed at the antimesenteric or the mesenteric border or at the midpoint between the two. Cotton or absorbable gut sutures have been used with no apparent complications. Silk sutures frequently produce peritoneal reaction even with pus and abscess formation. Care should be taken to start and finish the continuous suture 3 cm. from the ends of the loop to prevent acute angulations.

The terminal ileum should be folded when necessary and the folded loop should be directed upward to the liver in order to prevent its fixation to the posterior abdominal wall or to the pelvis. The replacement of the

greater omentum to its normal position prevents adhesion of the folded bowel to the abdominal wall, but in some cases in which resection of the greater omentum was indicated, no subsequent symptoms were observed.

The folding procedure can be total, comprising all of the small bowel or part of it, and depends upon the extent of the adhesions and the denuded surface. It is very important to liberate all of the previous adhesions before the folding procedure is carried out, and all raw surfaces should be covered by plication.

Three cases in which this operation was employed successfully are presented. —*Jose L. Bravo, M.D.*

LIVER, GALLBLADDER, PANCREAS, AND SPLEEN

The Diagnosis of Biliary Tract Disease; the Present Status of Liver Function Tests, Liver Biopsy, and Duodenobiliary Drainage. J. G. Mateer, J. I. Baltz, R. J. Priest, and J. W. Fischbein. *Med. Clin. N. America*, 1956, 40: 437.

Various laboratory aids which are of value in correctly diagnosing biliary tract disease are briefly discussed.

Liver function tests are of the most value in demonstrating early preclinical hepatic impairment. The bromsulphalein test, the zinc sulfate turbidity test, the urinary coproporphyrin test, and the intravenous hippuric acid test each contribute evidence independent from other tests in discriminating between normal and cirrhotic groups. The bromsulphalein test is the most specific, reliable, and effective of all liver function tests for demonstrating impairment of liver function in nonjaundiced patients. The bromsulphalein test can be accurately determined in icteric sera; however, the authors believe it unwise to use this test in the presence of jaundice. The cephalin-cholesterol flocculation test in collaboration with the alkaline phosphatase test is helpful in differentiating hepatic from obstructive jaundice. The thymol turbidity test is of particular value as a quantitative test of impaired hepatic function in the presence of jaundice and in following the course of a patient with acute hepatitis. The zinc sulfate turbidity test is somewhat like the thymol test in that it detects alterations in the serum gamma globulin. Zieve and Hill recommend this test as one which gives independent evidence in differentiating cirrhosis and acute hepatitis from the normal liver. The intravenous hippuric acid test is more accurate than the oral hippuric acid test; it is time-consuming and the results are not valid in the presence of impaired renal function or urinary retention. The galactose tolerance test does not yield information independent from the bromsulphalein test. The urinary coproporphyrin test is effective in acute hepatitis, but it is too time-consuming for routine use. The quantitative urinary urobilinogen test offers direct evidence in the differential diagnosis of hepatic and obstructive jaundice. Blood prothrombin determination is the least sensitive of all commonly employed tests for impaired liver function. Total serum cholesterol tends to be elevated in biliary duct obstruction. It must be remembered that liver function tests have limitations. They may show little or no impairment of liver function in the presence of moderately severe disease, or they may be impaired secondary to disease involving other organs of the body.

Pitfalls in the differential diagnosis of hepatic and obstructive jaundice are mentioned. First is failure to realize that final differential diagnosis may require 1 to 3 weeks of study. Other pitfalls are inadequate history, failure to obtain direct evidence of bile duct obstruction, and failure to interpret the tests in relation to the duration of jaundice.

Liver needle biopsy carries a very slight risk and should be limited to those cases in which the information is needed to establish the diagnosis and determine the course of therapy. Any evidence of a tendency to bleed must be ruled out. The patient should be observed closely for 24 hours in the hospital after the procedure. A positive biopsy specimen is significant. A negative specimen excludes diffuse hepatic disease, but does not exclude focal disease. It is useful in diagnosing systemic conditions involving the liver as well as in diagnosing the common hepatic conditions. Biopsy may also help differentiate hepatic and obstructive jaundice when clinical and laboratory studies fail to establish a definite differential diagnosis.

The authors employ duodenobiliary drainage as a diagnostic aid. It is of particular value in instances of cholecystographic nonvisualization, in postcholecystectomy common duct stone, and in cases of jaundice, in which cholecystography is of no value. The presence of calcium bilirubinate pigment and cholesterin crystals is evidence of the presence of gallstones.

—*Harold E. Kleinert, M.D.*

The Treatment of Bleeding from Portal Hypertension in Patients with Cirrhosis of the Liver. C. Stuart Welch, John E. Kiley, Thomas S. Reeve, Edward O. Goodrich, and Harold F. Welch. *N. England J. M.*, 1956, 254: 493.

The authors present the cases of 50 patients with cirrhosis of the liver, who were admitted to the hospital because of massive upper gastrointestinal bleeding. They propose a plan of treatment to reduce the mortality rate from hemorrhage in these patients. Thirty-three of the patients with cirrhosis and portal hypertension, who bled, died in the hospital, and 40 of the group died within a year of the occurrence of their hemorrhage. Thirty-eight of the patients with a first hemorrhage died, and the authors state that prevention should be the best solution to this problem. There is reason to believe that all patients with varices as the result of cirrhosis will bleed if they live long enough, and do not succumb to their liver disease first.

Thirty-four per cent of the patients whose death followed hemorrhage died in coma. The mechanism of the production of coma in these patients is discussed in detail. The authors believe that hepatic coma is initiated by the absorption of large amounts of digested blood in the intestine, the diseased liver not being able to metabolize normally the nitrogenous products resulting from the digestion and absorption of the blood.

A program of treatment for bleeding with cirrhosis is presented. Stopping the hemorrhage by the use of esophageal tamponade is the first step, as well as blood replacement. The authors believe that evacua-

tion of the blood from the gastrointestinal tract is the second most important step. They give milk of magnesia through the tube hourly, combined with enemas or colonic irrigations after the blood pressure is restored and stable. Blood, vitamins, especially vitamin K, and concentrated glucose solution are given to improve liver function. Finally, attempts should be made to reduce the concentration of ammonia in the blood by the administration of sodium glutamate, cortisone, wide-spectrum antibiotics, and the artificial kidney.

Arguments are presented that portacaval shunts be performed in patients with cirrhosis of the liver and esophageal varices before they bleed.

—*Robert Paradny, M.D.*

Postoperative Control of the Portal Circulation with an Indwelling Catheter in the Portal Vein. HANS CASTENFORS and BJÖRN NORDENSTRÖM. *Acta chir. scand.*, 1956, 110: 464.

IN RECENT YEARS, as the number of operative procedures for portal hypertension has increased, numerous reports of preoperative studies of the portal circulation have appeared in the literature. Postoperative studies of portal circulation have been made much less frequently, and the authors present a case in which such a study was carried out.

The studies were done in the case of a patient upon whom a splenorenal shunt had been performed for bleeding esophageal varices. The portography was performed through a No. 8 heart catheter inserted in the right gastroepiploic vein, with its tip into the main branch of the portal vein. Portal tension, initially 38 millimeters Hg, rose to 64 millimeters Hg during the procedure. At the time of the completion of the shunt it had fallen to 16 millimeters Hg.

Postoperative roentgen films showed an increase in the size of the shunt vessels, but no real change in the size of the portal veins. The patient ran a febrile course and thrombosis of the portal system was suspected. Thrombosis was ruled out by the portography, but the catheter was removed anyway. The patient deteriorated rather rapidly and died on the seventeenth postoperative day. Autopsy revealed an unusual finding, i.e., an active duodenal ulcer with erosion of vessels in its base. This was assumed to be the cause of death.

Although the termination in this case was unsuccessful, the authors feel that the technique described has merit for the study of the portal circulation after portal vein operative procedures.

—*Harold M. Unger, M.D.*

The Postoperative Course Following Total Right Hepatic Lobectomy. ABDOL H. ISLAMI, GEORGE T. PACK, THEODORE R. MILLER, PARKER VANAMEE, and Others. *Surgery*, 1956, 39: 551.

IN 4 PATIENTS with malignant tumors involving the right lobe of the liver, 70 to 80 per cent of the liver was removed. Various biochemical alterations in the plasma were followed during the first 13 to 21 postoperative days. Increased portal congestion in the remaining left lobe resulted in a transient increase in serum bilirubin. Cephalin flocculation and thymol turbidity increased in 2 patients in whom there had been normal figures preoperatively. One patient showed a marked decrease in alkaline phosphatase, cephalin flocculations, and thymol turbidity following removal of a large spindle-cell sarcoma from the liver. Prothrombin time was unaffected in the 2 cases followed.

Plasma proteins were reduced profoundly in all patients. Hydrogen-ion concentration, carbon dioxide, sodium, and other plasma electrolytes showed no significant changes. Blood ammonia levels remained normal in the 3 patients tested. Similarly, ammonium tolerance tests were normal in dogs following a 70 per cent hepatectomy. The clinical course was uneventful in these patients.

—*George R. Holswade, M.D.*

Intravenous Cholecystocholangiography in Emergency Abdominal Diagnosis. ROBERT S. SPARKMAN and PAUL R. ELLIS. *Ann. Surg.*, 1956, 143: 416.

THESE AUTHORS consider that the radiologic study of the biliary tract with cholografin may be useful when urgency of the disease makes it undesirable to wait for oral cholecystography, when vomiting prevents use of the oral method, and when preoperative information concerning the extrahepatic ducts is desirable to assist in determining the necessity of exploration of the common bile duct.

The dose of 40 milliliters of cholografin was used in all but one case; in the latter instance 60 milliliters was used because of extreme obesity. Ten cases are discussed in detail, with analysis in three categories: (1) visualization of the gallbladder and bile ducts; (2) visualization of bile ducts but not of the gallbladder; and (3) failure of visualization of either bile ducts or gallbladder.

Since obstruction of the cystic duct is the usual condition in acute cholecystitis, demonstration of both the gallbladder and bile ducts by intravenous cholecystocholangiography offers good evidence against this diagnosis. This point is illustrated by a case in which mesenteric thrombosis proved to be the disease in a patient whose clinical findings suggested acute cholecystitis.

The presence of visualization of the bile ducts and nonvisualization of the gallbladder is compatible with the diagnosis of acute cholecystitis. Of 7 patients in this group, operation was performed in 6. Acute cholecystitis was confirmed in 5 of these, and the sixth had acute pancreatitis without gallstones. In 2, the common duct appeared dilated by the radiologic examination; stones were recovered from the common duct in one of these patients, and the other had acute pancreatitis.

Failure of visualization of any part of the extrahepatic biliary tract may be due to liver disease or to common duct obstruction. Clinical and laboratory evidence rather than cholangiography must be used to distinguish these mechanisms. Jaundice of more than mild degree usually precludes visualization of the biliary tree by this technique. Two cases of nonvisualization are presented in which extrahepatic ductal obstruction due to gallstones was suspected clinically, and in both stones were found in the common bile duct.

The authors believe that this technique offers sufficient promise to warrant further trial.

—*E. Thomas Boles, M.D.*

The Interpretation of the Intravenous Cholangiogram. ROBERT E. WISE and RICHARD G. O'BRIEN. *J. Am. M. Ass.*, 1956, 160: 819.

IN 300 CASES, sodium iodipamide was injected intravenously in order to obtain serial cholangiograms. The results were studied in an effort to determine the various degrees of dilatation of the common bile duct, to relate them to preoperative and postoperative pain, and to establish criteria for preoperative diagnosis.

Visualization never occurred when the serum bilirubin level was above 4.8 milligrams or when the bromsulfalein retention was above 64 per cent. In 142 patients the bile passages were successfully visualized after cholecystectomy, so that the diameter of the common duct could be measured. These data were compared with the results of actually exploring the duct for obstructions. All ducts dilated to a diameter greater than 15 millimeters were found to be partially obstructed, and all those narrower than 8 millimeters were unobstructed. The 82 ducts of intermediate diameter (57 per cent of the cases visualized) thus formed an important group in which the diameter of the duct was of no value in telling whether it was obstructed. Sodium iodipamide given intravenously afforded visualization of the gallbladder in 12 out of the 34 patients in whom visualization had succeeded poorly, or not at all, when the medium was given orally.

The authors state that intravenous cholangiography is a relatively safe procedure that is indicated in evaluation of the patient with the same or new symptoms referable to the biliary tract after cholecystectomy. It is indicated particularly in those patients in whom visualization of the gallbladder fails with orally given dye, in order to evaluate more accurately the status of the gallbladder and the common duct as well. Partial obstruction of the common duct appears to be relatively common in patients with "postcholecystectomy syndrome." Proper precholecystectomy use of the method for evaluation of the common duct should result in fewer failures of gallbladder surgery. This may necessitate re-evaluation of some of the present-day concepts of the postcholecystectomy syndrome. More widespread use of this procedure and further knowledge will lead to a more accurate evaluation of the postcholecystectomy syndrome, which may be removed from a functional classification to a classification of organic disease. —*Robert Turell, M.D.*

Traumatic Injuries of the Gallbladder. EMMETT R. HALL, JR., JOHN M. HOWARD, GEORGE L. JORDAN, and WALTER E. MIKESKY. *Arch. Surg.*, 1956, 72: 520.

TRAUMATIC PERFORATION of the gallbladder occurs in about 2 per cent of cases of abdominal trauma; it may result in death if not recognized, and is usually nonfatal if operative treatment is instituted.

Of 25 such patients observed in a 15-year period, 14 were injured by bullets, 9 by stab wounds, and 2 by blunt trauma. All patients were treated for shock and then subjected to laparotomy. If there is extensive gallbladder injury, cholecystectomy is indicated, and this was done in 14 of the patients in the present series. Two of the 14 died. If feasible, it is better to preserve the gallbladder by simple suture of the defect. Simple suture was done in 8 patients, with no mortality. In 3 patients, all with bullet wounds, cholecystostomy was done, with death of 2. In the 6 patients treated during the period before antibiotics and adequate blood bank facilities were available, the mortality was 50 per cent. Thereafter the mortality rate was 11 per cent.

Sterile bile can apparently leak into the peritoneal cavity for relatively long periods of time without serious reaction or symptoms; however, the danger of supervening infection is always present, and prompt laparotomy is the chosen course of treatment as soon as the diagnosis is made. Simple suture is the preferred procedure, although cholecystectomy may be necessary. A drain is always left in the area postoperatively. —*Stanley W. Tuell, M.D.*

The Hazards After Cholecystectomy, with a Review of 500 Case Records. JAMES MACRAE YEATES. *Med. J. Australia*, 1956, 1: 646.

FOLLOWING the sudden death of a patient after an uncomplicated cholecystectomy, the author reviewed the case records on 500 consecutive cholecystectomies and arrived at certain conclusions.

Stones were found in 85.2 per cent of the cases. The common duct was explored in 10.2 per cent. Although primary closure of the common duct following exploration has been recommended by others, this author found that in almost all cases the common duct had been drained.

Chest complications were very common but of a minor nature. There were no deaths due to pulmonary complications. There were no cases of pulmonary embolism, and venous thrombosis of the lower extremity was found only five times. Anticoagulants were given in 4 of these cases. There were 10 cases of hemorrhage, and in only 3 of these was the hemorrhage from the liver bed. (Strict care must be given to hemostasis here.) There were 21 cases of wound infection and 4 cases of evisceration, and all of these patients survived after closure of the wound with interrupted nylon sutures.

There were 5 deaths after exploration of the common duct and, of these, 3 were due to hemorrhage. In addition there were 5 deaths after cholecystectomy, all due to lethal collections of blood, bile, or pus.

The author emphasizes the fact that surgeons must always be alert to the fact that it is usually a complication of the surgery itself which is responsible for death. He points out that early surgery for cholelithiasis prior to the advent of complications will further reduce the mortality. —*Harold M. Unger, M.D.*

Demonstration of the Pancreatic Ducts During Gastric Resection by Means of Contrast Media (Kontrastdarstellung des Pankreasausfuehrungsganges bei Magenresektion). WERNER STENGEL. *Chirurg*, 1956, 27: 5.

THE ANATOMY of the duodenal region can be greatly changed by chronic duodenal ulcer. This is true especially of the relationships between the common bile duct, the pancreatic ducts, and the duodenum. The accidental opening or ligation of one of these ducts may go unnoticed and lead to serious complications. If the peritoneum were drained, a fistula might develop, but usually the patient expires.

The author believes that these accidents happen more often than the literature indicates. Accidents to

the common bile duct are relatively easy to notice at the time of surgery because of the color of the bile, the increased pressure, and the compressibility of the gallbladder. On the contrary, the pancreatic secretion is colorless, is under little pressure, and is small in volume during anesthesia. Ligation of the main pancreatic duct is commonly missed and with the resulting pancreatitis may prove fatal. Yet, removal of the ligature may prevent complications.

The author quotes case reports from other clinics in which the damage, if recognized at the time of surgery, could be repaired with no harm done, while in the cases in which it was not recognized, fatalities resulted. He points out that various surgeons have performed direct reanastomosis, cholecystoduodenostomies, or even transplantations of the ampulla of Vater.

He describes in great detail a case of Walzel's, in which a pancreatic duct the size of a "string" was found opening into the ulcer crater. This was thought to be the accessory pancreatic duct and was ligated. The patient expired and at autopsy the ligated duct was found to be the only drainage of the pancreas. The author quotes the anatomical literature to the effect that this may occur in from 2 to 8 per cent of the cases.

His own case was that of a 55 year old man with a chronic duodenal ulcer. At surgery a small duct, "stringlike," was found running from the pancreas into the ulcer crater. This was thought to be the accessory duct, but a small polyvinyl catheter was placed in it and a retrograde pancreaticogram was made. This showed that there was no other pancreatic duct connecting with the duodenum. Accordingly, a gastric resection was carried out in a Polya-Reichel-Mikulicz fashion, and a Y anastomosis using the jejeunum was formed to receive the pancreatic drainage. Aside from a slight elevation of the urinary diastase, the patient had an uneventful recovery. Follow-up at 6 months showed normal pancreatic and biliary function. —*Richard J. Ireton, M.D.*

Operative Contrast Visualization of Pancreatic Disease. HENRY DOUBILET and JOHN H. MULHOLLAND. *Surg. Clin. N. America*, 1956, 36: 385.

ACCURATE VISUALIZATION and exploration of the pancreas is difficult because of its inaccessible location. Pancreatic pain is experienced only when the ducts are distended or when inflammation extends to contiguous organs. Although gross changes in the pancreas can be detected after mobilization, it is difficult to observe such changes in the presence of inflammatory adhesions.

Operative contrast visualization of the pancreatic ductal system coupled with operative cholangiography provides information that is valuable both diagnostically and in the selection of appropriate surgical procedures.

Operative cholangiography. Simultaneously, 35 to 50 per cent of contrast media is injected into the cystic or common duct and 30 cubic centimeters of N/10 hydrochloric acid are instilled through a previously placed tube into the duodenum. If a common channel is present, contrast media will ascend the pancreatic duct as a result of the induced sphincter spasm. The following pertinent information may be obtained by this technique: (1) the presence of stones, particularly at the ampulla; (2) diameter, direction, and curvature of the common duct and the direction of its insertion into the duodenum; (3) degree of narrowing of the distal end of the common duct; and (4) the presence of a common passageway between the common and pancreatic ducts.

Operative pancreatography. Following transduodenal section of the sphincter of Oddi, a fine plastic tube is inserted 4 to 5 cm. into the duct of Wirsung. Ten cubic centimeters of radiopaque solution are slowly injected over a five-minute interval. The x-ray exposure is accomplished during injection of the last 2 cubic centimeters. If retention of the tube is indicated by dilatation of the duct or incision of the pancreas, it is brought out through the cystic duct or alongside a T-tube in the common duct. Subsequent serial pancreatograms may then be obtained to study regression of pancreatic lesions. The following findings may be observed by this study: (1) delineation of the pancreatic duct system; (2) the presence of a communicating duct of Santorini; (3) dilatation of the duct system; (4) organic obstruction; (5) the presence of cysts or pseudocysts; (6) degree and extent of acute inflammation; and (7) opacification of the pancreas to demonstrate solid tumors without ductal communication.

These features are illustrated by case abstracts and pancreatograms. Guidance by pancreatography in the selection of the appropriate procedure and postoperative studies are stressed.

The authors advocate pancreatography as a safe method of extending exploration and demonstrating the normal anatomy and pathology of the pancreas. This procedure has been useful in establishing principles upon which the treatment of pancreatitis and its various complications are based.

—*Luther M. Keith, Jr., M.D.*

Pancreatic Injuries; Diagnosis, Therapy, and Prognosis (Zur Klinik, Therapie, und Prognose der Pankreasverletzungen). H. DENCK, and A. ZÄNGL. *Klin. Med., Wien*, 1956, 11: 113.

IN 486 ABDOMINAL INJURIES observed from 1933 to 1954, there were 7 of the pancreas (1.44 per cent), 5 of which were due to blunt trauma of the abdomen, two were caused by pistol fire. Suspicion of pancreatic injury was entertained preoperatively in only one case. The clinical manifestations of a recent pancreatic injury depend on the injuries inflicted simultaneously on other organs of the abdominal cavity. Severe shock was present in all of the patients, followed by symptoms of beginning peritonitis after a variable interval (1 to 50 hours). Muscular rigidity, pale skin, tachycardia, dry tongue, and vomiting were present. However, specific signs were lacking even in 2 patients with isolated rupture of the pancreas. Pain on epigastric pressure, foreign body sensation in the throat, and distention of the transverse colon are said, by some to be characteristic for pancreatic injury. Pain radiating to the left shoulder is reported as a frequent symptom.

Clinically, an increase in the severity of peritonitis was considered an indication for operation. Chemical changes (blood sugar, blood and urine diastase, atoxyl resistant lipase) were considered important only for determining the functional state of the pancreas postoperatively.

Difficulties in diagnosis led to the conclusion that in doubtful cases it is safer to operate. Tamponade and drainage were the only measures employed. Fistulas, clearing within 6 weeks, appeared in 3 of the 4 surviving patients. No death was attributed to therapy since one patient was admitted in a moribund condition and the remaining 2 had extensive visceral injuries besides damage to the pancreas.

—*Sidney Smedresman, M.D.*

Acute Pancreatitis. A. H. Aaron and Elmer Milch. *Med. Clin. N. America*, 1956, 40: 451.

The pathology of acute pancreatitis ranges from a transient pancreatic edema, probably associated with milder clinical attacks, to hemorrhage and fat necrosis seen with the severe clinical episodes. Obese, middle-aged males who have recently overindulged in food or alcohol are the most frequent victims. Abdominal pain is acute, radiates to the back, and is associated with shock in the severe forms of the condition. Nausea and vomiting are frequent. In about one-fourth of the cases, jaundice develops as the result of obstruction of the common duct by gallstones, edema of the pancreas, or an associated hepatitis. The abdomen is tender and may be distended. Rebound tenderness is present. Peristalsis is absent. There may be flatness on percussion, at the base of the left lung. Cutaneous signs such as edema, induration, and ecchymotic discoloration of the skin in the region of the flanks or about the umbilicus (Cullen sign) may occur. Serum amylase determination is the most valuable laboratory diagnostic aid at the present time. It must be remembered that an increased serum amylase may also occur in other acute abdominal conditions, but it seldom reaches the high figures seen in acute primary pancreatitis. Other laboratory tests used are blood lipase, antithrombin titer, serum calcium, and blood glucose. Roentgenography of the abdomen is another diagnostic aid.

Acute pancreatitis is best treated by conservative nonoperative means. It must be differentiated from other acute abdominal emergencies. Biliary tract disease is not as severe as acute pancreatitis unless a gangrenous or acute suppurating cholecystitis is present. Perforated gastric or duodenal ulcer will demonstrate more diffuse abdominal tenderness and muscle rigidity. A flat film often reveals the presence of air in the subdiaphragmatic spaces. Serum amylase may be elevated if the ulcer has involved the pancreas and invoked an acute pancreatitis. Vascular abdominal accidents may mimic acute pancreatitis. Coronary insufficiency or occlusion is often associated with a previous history of anginal attacks. In acute pancreatitis, changes may also appear on the electrocardiograph.

Surgeons and physicians are in general agreement that if the diagnosis of acute primary pancreatitis can be made, with the elimination of etiologic factors such as ruptured peptic ulcer or biliary tract disease, the patient should be treated medically rather than by immediate surgical intervention. Treatment is directed toward relieving pain and often this is accomplished best with paravertebral block or continuous epidural analgesia. Shock must be combated with the administration of plasma or whole blood; recently, serum albumin has been used. Fluid and electrolyte balance must be maintained. Glucose solutions are contraindicated unless covered by adequate amounts of insulin. Abdominal distention is controlled with an indwelling nasogastric tube attached to suction. Antibiotics are employed prophylactically to prevent suppuration. Drugs such as atropine, intramuscularly, will depress vagal activity and reduce secretion. Calcium gluconate is administered upon the appearance of calcium deficit. Permanent diabetes is a common after-effect of acute pancreatitis, and consequently blood and urine must be examined at frequent intervals. The duration of therapy depends upon the progress of the patient. Careful watch must be kept for complications such as hematoma, acute cyst formation, abscess formation, or spreading peritonitis. If operation is performed because of doubt as to the exact diagnosis, and acute pancreatitis is found, the abdomen should be closed immediately unless definite disease is found in the biliary tract.

The mortality rate among patients with acute pancreatitis who are subjected to operation is much higher than for patients in whom surgery has been delayed or omitted. About three-fourths of the patients will have further attacks. —*Harold E. Kleinert, M.D.*

GYNECOLOGY

UTERUS

Retrodeviation of the Uterus and Sacral Pains (Die Retrodeviation des Uterus und Kreuzschmerzen). ELMA NYLANDER. *Ann. chir. gyn. fenn.*, 1955, 44: 300.

A QUESTIONNAIRE was sent to 250 women who had undergone corrective surgery for retrodeviation of the uterus. Of this number, 196 sent in replies to the questions asked. Of these 196 women, who had undergone a corrective operation, only 21 (10.7 per cent) have since been entirely free of pain and 103 (52.5 per cent) have experienced some decrease of their pain postoperatively. These figures indicate, in the author's opinion, that retroversion of the uterus is to be considered as one of the factors at work in the causation of sacral pain in women, and that corrective surgery will at times relieve the patient of her complaints.

In a further study of this problem, roentgenograms of the lumbopelvic region of women with a retroverted and retroflexed uterus who complained of sacral pain were prepared (200 cases). Of these 200 women, 59 exhibited roentgenologic changes and 70 showed the Knutsson signs of discal degeneration. Among the 59 women there were 20 instances of transition vertebra, 3 of spina bifida posterior to the fifth lumbar vertebra, 10 of "sacrum acutum," 4 of scoliosis, 3 of osteitis condensans ilii, 9 of osteoporosis, 5 of osteochondrosis juvenilis lumbalis, and 5 of spondylosis deformans.

Among the 70 women there were 41 instances of sclerotic and marginal changes in the vertebrae, 23 instances of narrowing of one or two intervertebral spaces, 1 case of retroposition of the fifth lumbar vertebra, 3 cases of spondylolisthesis of the fifth lumbar vertebra and 2 of pseudospondylolisthesis.

In the remaining 71 women, in whom the roentgenologic findings were negative, the retrodeviation of the uterus seemed to represent the sole cause of the back pains; however, of the 28 who were operated upon and from whom information could be obtained later, 16 (57 per cent) still complained of the sacralgia.

From the evaluation of the results procured in this material, the author concludes that the roentgenologic examination of the sacral region is of the greatest importance in women with sacral pains, because patients with signs of vertebral disease may be excluded from gynecological treatment. Roentgenologic examination of the lumbosacral region and of the pelvis should always be undertaken before an operation is carried out to correct the position of the uterus for the relief of sacral pains.

However, even in patients in whom the roentgen findings are negative, it cannot be affirmed with certainty that the sacral pains will leave after surgical correction of the malposition—*John W. Brennan, M.D.*

Uniformity of Secretory Endometrium. ROBERT W. NOYES. *Obst. Gyn.*, 1956, 7: 221.

THE QUESTION posed and answered in the affirmative in this interesting paper is: will a small sample of endometrium obtained by endometrial biopsy during the secretory phase of the menstrual cycle be representative of the total mucosal response, and will that response be uniform in different areas of the uterine cavity?

It is known that the lining of polyps and of the lower uterine segments and the basal endometrial layers are relatively unresponsive to cyclic stimuli, but these structures can usually be differentiated by stroma and vessel characteristics. It has also been postulated and questioned recently whether the endometrium may show irregular ripening with differences of as much as 3 to 4 days in development, especially in infertile women and in connection with ectopic pregnancies.

In a first series of 100 young, healthy, though infertile, patients endometrial biopsies were taken from 4 uterine quadrants during the last 2 weeks of the menstrual cycle. Each strip was imbedded in a separate block from which four to six sections were examined and dated after scrambling of the slides. Seventy-seven of the 100 endometriums showed highly uniform samples, while 18 presented a moderate, and 5 a higher degree of variability. In most of the nonuniform cases insufficient material for dating was at fault rather than a true variability in endometrial response. The standard deviation of the differences in the 100 sets of biopsies was only 1.1 days.

These analysis of 100 endometriums from hysterectomy specimens has been presented elsewhere. Eighty-three of these showed uniformity, and only 4 showed a variability that could not be explained by disease, trauma, technical faults, etc. To demonstrate transition zones between the differently dated areas in one specimen, long endometrial strips from 20 carefully selected uteri were obtained in a third series, and were studied for unresponsive areas. In one of the cases an endometrial polyp was found to be the cause for a lack and variability in endometrial response. Among 850 slides studied, there was only one case in which the rare occurrence of irregular ripening was evident in the myomatous uterus of a 37-year-old parous woman.

The chance of finding such areas by biopsy or in random endometrial sections is remote. If an adequate specimen is studied and the limitations of histologic interpretation are understood, the estimate of the hormone time relationship should be highly accurate from a small biopsy.

—*W. D. Bergman, M.D.*

Some Aspects of Disease of the Portio Vaginalis as Illustrated by Colposcopic, Colpocytologic, and Histologic Investigations (Alcuni aspetti di patologia della portio alla luce delle indagini: colposcopia-colpocitologia- istologia). ETTORE MORANO. *Minerva gin.*, Tor., 1956, 8: 105.

THE FEMALE SEX ORGANS constitute a favorable site for the development of malignant tumors. The three areas most frequently involved are the body of the

uterus, the cervix, and the ovary, and cancer of the cervix is three times more frequent than cancer of the other two areas. The authors outline the initial steps of the diagnosis, which include vaginal and specular examinations, Schiller's test, vaginal cytology with interpretation of the slide, and colposcopy, a recent procedure.

After carefully taking the history, the patient is colposcoped, and if the nature and extent of the lesion warrant it, a circular biopsy is taken. This routine includes three diagnostic procedures: colposcopy, colpocytology, and histology, which when combined serve to differentiate the various lesions, both benign and malignant.

The author concludes by explaining that as a result of this extensive study, marked alterations of the cervix are at times shown to be benign, while clinically they were thought to be erosions of a malignant nature. While on the other hand, clinically innocent-appearing lesions may in reality be the seat of malignant changes of varying degrees, including preclinical newgrowths. Detailed photographs tend to support the value of this threefold study.

—*Vincent Ippolito, M.D.*

Tuberculosis of the Endometrium. ARTHUR M. SUTHERLAND. *J. Obst. Gyn. Brit. Empire*, 1956, 63: 161.

IN RECENT YEARS there has been a widespread awakening of interest in the whole subject of genital tuberculosis. It is now realized that this condition is much more frequent than was previously thought. The discovery may be due to the routine use of endometrial biopsy or diagnostic curettage in patients with infertility, irregular uterine bleeding, or amenorrhea.

Over a 7-year period at the Royal Samaritan Hospital for Women, Glasgow, Scotland, 5,521 curettings and 864 uterine specimens were examined histologically. Tuberculosis of the endometrium was found in the curettings sixty-one times (1.1 per cent) and in the uterine specimens, twelve times (1.4 per cent).

During a 20-year period 65,943 patients were admitted to the hospital. Histologically proved genital tuberculosis was discovered in 369 patients (0.56 per cent). Tuberculosis of the endometrium was found in 178 cases (48 per cent of genital tuberculosis and 0.27 per cent of all admissions). The incidence of endometrial tuberculosis was three times as high in the second 10-year period than in the first decade.

During a 20-year period 3,804 cases of primary infertility received either a curettage or an endometrial biopsy. Endometrial tuberculosis was found in 216 (5.6 per cent).

One thousand patients having abnormal uterine bleeding in the absence of gross pelvic pathology were studied. Tuberculosis of the endometrium was found on 10 occasions (1 per cent).

In 200 women under the age of 20, with abnormal uterine bleeding, endometrial tuberculosis was found in 8 cases (4 per cent).

One thousand patients having abnormal uterine bleeding in association with gross pelvic disease were studied. Tuberculosis of the endometrium was found nine times (0.9 per cent).

One thousand patients with postmenopausal bleeding were reviewed. Tuberculosis was found only once.

Two hundred cases of proved endometrial tuberculosis investigated in the past 5 years are reported. Of these patients, 111 presented a history of previous extragenital tuberculosis. The average age of the patients was 28 years—the youngest being 16 and the oldest, 48. As only 23 of 177 married patients gave a history of a previous pregnancy, 154 revealed the status of infertility. Infertility was the most common symptom. Lower abdominal pain, profuse and sometimes irregular bleeding, and secondary amenorrhea were common complaints. Roentgen films of the chest revealed 7 unsuspected active pulmonary lesions and 79 healed ones. Calcified abdominal glands were noted 24 times. Fifty unsuspected extragenital tuberculous lesions were discovered. On pelvic examination, 71 patients had normal pelvic structures. In the remainder, adnexal swelling, usually bilateral, was the major finding. Of the patients with infertility, tubal blockage was noted in 65 per cent. The diagnosis was based on the histologic evidence from endometrial scrapings. Bacteriologic evidence was positive in 141 cases. Sensitivity tests were also determined.

Various medical regimens of treatment were carried out. Streptomycin and PAS were used in 137 cases; 69 per cent remained negative after treatment. Streptomycin and INH were used in 53 cases. Eighty-one per cent remained negative after treatment and 38 per cent (12) were cured. Of 2 patients with positive findings after a second course and who received a third course, one was cured. Drug reactions were common and treatment had to be discontinued in 26 patients. No permanent ill effects developed.

Treatment relieved all symptoms and findings in almost all of the patients, but had no effect on infertility.

—*John R. Wolff, M.D.*

The Early Detection of Cervical Cancer by Newer Methods (Le dépistage précoce du cancer du col utérin par les méthodes modernes, étude critique des diverses techniques a l'attention du practicien). J. P. PUNDEL and F. SCHWACHTGEN. *Gyn. prat.*, 1956, 7: 7.

THE TREATMENT of cervical cancer still takes too many lives and the only hope for improvement lies in the early detection of the lesion. A normal routine gynecological examination is usually insufficient for the detection of an early cancerous lesion. Usually a more meticulous examination such as the Schiller test, colposcopy, or a cytological diagnosis and biopsy will be necessary. The colposcopy requires adequate training, but only exocervical lesions can be explored. The same applies to the Schiller test. Various Swiss and German authors believe that the cytological diagnosis is far superior to the Schiller test and colposcopy in combination. Only Moricard believes that the Schiller test followed by colposcopy and biopsy is sufficient.

However, cytologic examination will also be of great value in the diagnosis of malignancies of the uterus, tubes, and ovaries. Cytologic diagnosis will, in almost 100 per cent of the cases, be an adequate detection procedure. In 174 cases, only 2 negative results were obtained. In 1 case there was an advanced lesion and in the other there was an epithelial epithelioma which became positive on a second smear.

Certain requirements will have to be met in order to obtain successful results: (1) one must have a com-

petent cytologist; (2) the smears must be taken competently, and fixed and colored correctly; and (3) one must confirm the cytological diagnosis by a histological examination. Sometimes the histological interpretation may be doubtful and interpreted differently. The authors have approached these cases conservatively and followed up the patients carefully after electrocoagulation. A false negative smear can be catastrophic for the patient. Therefore, the authors accept a diagnosis as final only after three negative smears have been obtained and the colposcopy is negative. Smears taken after a biopsy of the lesion and reported as suspicious of, or positive for intraepithelial epithelioma by the pathologist, have constantly been negative after anti-infectious treatment. On the basis of a few cases, the authors prove how a wrong primary diagnosis was finally corrected by use of the cytological technique. Very often the cytologist and the anatomopathologist should be different persons in order to exclude a possible prejudiced report. If possible, the gynecologist should try to acquire sufficient training in reading his own smears.

The combination of cytodiagnosis, the Schiller test, and colposcopy should eliminate most of the errors which might be made individually. The next problem is how to treat an intraepithelial epithelioma. In order to exclude cancer one must have repeated negative results. Rather than have different persons look at one slide, it is preferable to take another biopsy which might be better for examination. In addition to the smear and biopsy, a curettement should be done. If the lesion is restricted to the exocervix, a cold knife conization is done and the patient is followed up. If the endocervix is diseased, a high cervical amputation is done and if the following smear is still suspicious or positive, a hysterectomy is performed.

—*Robert O. Verheecke, M.D.*

Preliminary Results of Attempted Radical Surgery in Recurrent Uterine Carcinoma. JOHANNES THYSSEN. *Acta obst. gyn. scand.*, 1956, 35: 1.

THE AUTHOR believes that any attempt at effective treatment of recurrent uterine carcinoma must be surgical, because continued or repeated irradiation produces little or no effect. Failure may be attributed, first, to local recurrence (the tumor originally having responded to therapy), and secondly to the fact that some tumors are radioresistant.

Attempted surgical treatment of recurrent uterine cancer must of necessity depend upon the extent of the recurrence. The principal methods of operation are: (1) total hysterectomy of the Wertheim (1911) type with simultaneous removal of the upper part of the vagina, the paravaginal and parauterine tissues, and the adnexa; (2) pelvic exenteration, which may be total or less extensive. If there is any hope from radical surgery in the treatment of this serious condition, operation should be considered, particularly where there is marked local spread or invasion of the bladder or rectum. Cervical carcinoma has a marked tendency to remain localized in the pelvis for a long time.

Total pelvic exenteration, first described by Brunschwig in 1946, consists of removal of the uterus and adnexa, the vagina and vulva, the bladder with the lower part of the ureters, the rectum with the lower part of the sigmoid colon, the peritoneum and all connective tissue, and the lymphatics and lymph nodes in the true pelvis. The ureters are implanted into the colon and a colostomy is formed. Two modified techniques of colostomy are suggested—the transverse colostomy of Parsons, which diverts the fecal stream from the ureterosigmoidostomies, and the colostomy of Bricker, who solves this problem by implanting the ureters into a short isolated segment of the small intestine brought out through the abdominal wall as a separate stoma.

One type of this operation—the anterior exenteration—is applicable in instances in which the tumor has spread forward and invaded the bladder, and the rectum is believed to be free of disease. The decision as to whether the entire vagina is to be removed is based upon the extent of spread in the vagina. Details of this operation have been described by Ingersoll (1954).

The other type—the posterior exenteration—described by Ulfelder in 1954, comprises removal of the anus, the rectum, the lower part of the sigmoid colon, the uterus with adnexa, and the vagina. In addition, a large portion of the pelvic peritoneum is removed as well as the connective tissue with the lymphatics and the lymph nodes. The removal of lymph nodes along the pelvic wall must be performed separately, not as a part of the en bloc excision, as the blood supply to the bladder and ureters must not be impaired.

The authors reserve their final decision as to the stage of the carcinoma until after completion of surgery and histologic examination. It may be very difficult after radiotherapy to assess the exact stage of the lesion by gynecologic examination.

The present study is based on the author's observations of 72 patients with recurrent uterine carcinoma who were admitted to the Surgical Department of the Finsen Institute. There were 53 patients with recurrent cervical carcinomas, of which 9 were radioresistant; 28 were deemed operable and 25 were inoperable. There were 19 patients with recurrent carcinoma of the corpus; 10 were considered operable, and 9 were inoperable. Six of the 72 patients were not subjected to surgery.

The authors note that the operation constitutes a severe trauma, and that blood, plasma, water, and electrolytes must be closely watched, as well as the tremendous loss of protein from the large denuded areas. Antibiotics are administered, and Miller-Abbott or Cantor tubes are used.

In conclusion, the authors attempt to evaluate the indications for the various operations, and enumerate a few of the main rules to be observed in the treatment of recurrent uterine cancer.—*Byford F. Heskett, M.D.*

An Analysis of 6,891 Hysterectomies for Benign Pelvic Disease; with Special Reference to the Safety of Routine Total Abdominal Hysterectomy. C. GORDON JOHNSON, CHARLES F. MOLL, JR., and LEWIS POST. *Am. J. Obst.*, 1956, 71: 515.

WHENEVER abdominal hysterectomy is indicated, a total hysterectomy should be done. This trend and an increase in the number of vaginal hysterectomies have been noted all over the country for the last 25 years, because hysterectomy has become the safest of all

major abdominal surgical procedures and is extraordinarily successful with regard to its end results. Between 1939 and 1954 a total of 6,280 hysterectomies for benign disease were performed at the Tulane unit of the New Orleans Charity Hospital. Subtotal hysterectomies were done in 45 per cent of the cases in the 1939 to 1940 period, but no subtotal operations have been performed since 1952. Of an additional 639 private patients of the senior author, only 9 were subjected to subtotal hysterectomy, all prior to 1948. During the period reported—while total hysterectomy replaced the subtotal operation—the mortality declined from 1.68 to 0.4 per cent. Two-thirds of the operations were done under spinal analgesia and the rest under inhalation anesthesia except for 7 which were done under local anesthesia on elderly women with complete uterine prolapse.

Fibroids accounted for 31 per cent of all hysterectomies in negroes as compared to 15 per cent in white women, and the fibroids were larger and more often complicated in the colored patients. Eighty per cent of all operations for pelvic inflammatory disease were done on negro women, and the disease appeared to be as frequent and as severe as before the antibiotic era. Nearly one-third of 366 patients with pelvic inflammatory disease had developed tuboovarian abscesses, and 19 of these had ruptured. In this catastrophe the previous high mortality of about 90 per cent was reduced to 15 to 20 per cent by an aggressive policy of immediate total hysterectomy, since it was believed that removal of the uterus in the presence of abscesses was safer than its retention.

Total hysterectomies were done in all cases in which pelvic surgery was indicated, in which the general condition of the patient permitted, and in which childbearing would be impossible, for instance, when both tubes had to be removed for pelvic inflammatory disease or ectopic pregnancy. The uterus in these cases was considered a useless organ since menstruation per se cannot be considered to contribute in any way to the woman's health or well-being. In at least 25 of 117 patients childbearing was no longer possible after previous surgery, and the large number of previously performed "conservative operations" that had failed to relieve the original symptoms, and had often added new ones, obviously favored such an approach. Sincy hysterectomy has become so safe, there is hardly any reason why in the vast majority of cases procedures like the Manchester operation, Watkins' interposition operation, uterine suspension, or plastic procedures on the cervix should be employed any longer at the present time.

Further points in favor of the more radical approach are the following:

The retention of the cervix may give rise to troublesome bleeding, infection, pain, or prolapse. The cervix seems to be diseased in a large percentage of cases in which hysterectomy is indicated. Also there is no doubt any longer that the risk of a consequent carcinoma in the cervical stump considerably outweighs the increased risk of a slightly more formidable procedure. Also, the authors do not believe that coexistent medical disease would convert a poor surgical risk into a contraindication to operation by extending the supracervical into a total hysterectomy. It is understood, of course, that all complicating disease is completely under control before surgery by collaboration with the internist.

The abdominal and the vaginal approach are not considered competitive in any way. Recently the vaginal approach has been employed more frequently in negro patients with their much higher rate of pelvic fixation by inflammatory adhesions, although it is still used much more frequently in white patients.

The postoperative morbidity in part of this series (after 1952) was 48 per cent in 810 abdominal hysterectomies, and 53.4 per cent in 436 vaginal hysterectomies, and the great majority of these temperature elevations was transient. Postoperative complications occurred in 17.4 and 24.8 per cent, respectively and were mostly inconsequential. Urinary tract complications predominated. It is unlikely that any one of the five deaths which are described in detail, would have been avoided by substituting the subtotal operation.

In the discussion of this article all of the speakers agreed with the general ideas expressed therein. The argument of possible prolapse or shortening of the vagina was rejected, and it was mentioned that a speculative so-called "prophylactic hysterectomy" in the fourth decade of a female would prolong her life statistically by 5 months only.

—*W.D. Bergman, M.D.*

ADNEXAL AND PERIUTERINE CONDITIONS

Experience with Radioactive Colloidal Gold in the Treatment of Ovarian Carcinoma. WILLIAM C. KEETTEL and H. B. ELKINS. *Am. J. Obst.*, 1956, 71: 553.

THE 5-YEAR SURVIVAL in patients with ovarian carcinoma is lower than in endometrial and cervical cancers and, in recent years, very little prognostic progress has been made in this disease in contrast to uterine cancers. This is due to the inaccessibility of the ovaries, the absence of external desquamation that could be investigated cytologically, and usually an asymptomatic course of the disease before the stage of metastatic spread has been reached. Even routine pelvic examinations have not eliminated that risk, and this is pointed out by two cases in this series in which the patients had a stage 4 spread only 4 to 5 months after a regular semiannual check.

During the years 1952 to March 1955 the authors attempted to find desquamated intraperitoneal cells by two methods. First they lavaged the cul-de-sac with 25 to 75 milliliter normal saline through a 13-gauge needle in patients over 35 years of age, without palpable tumors, who underwent diagnostic curettage. In another group of surgical patients, small amounts of free fluid or washings with 100 to 125 milliliters of saline were obtained from the cul-de-sac at the time of surgery. All specimens were examined cytologically and resembled routine cytologic specimens except for a large amount of mesothelial cells. Ascitic fluid with its variety of large and irregular cells made a cytologic diagnosis practically impossible.

Of a total of 247 cul-de-sac aspirations, 127 smears were negative and 3 were suspicious. One of the 3 patients with suspicious smears had an adenocarcinoma of the uterus with a Brenner tumor of the ovary, and

the other 2 were clinically free of neoplasm. In 117 instances the smear contained no cells, or only red cells. Two patients had incomplete surgery performed elsewhere for ovarian carcinoma, but had negative aspiration smears. The procedure was discontinued since it did not seem to offer any diagnostic help.

Peritoneal washings were available on 275 patients and 13 had positive results on the smear. Twelve of the patients had ovarian malignancies, and one a carcinosarcoma of the uterus. Four other smears were suspicious. There were 35 benign ovarian tumors in the series, one of which had a false positive result (atypical). In 20 patients with histologically proved cancer, 13 had positive or suspicious smears, while in 4 cases no abnormal cells were seen. Five patients with cystadenocarcinoma of the ovary had no evidence of spread or free fluid, an intact capsule, and still showed malignant cells free in the abdomen. This was the most significant finding in the series, which may well be explained by an early spread through lymphatic channels. It is hoped that eventually suitable cases for colloidal gold therapy may be selected on the basis of similar cytologic findings.

The treatment of ovarian carcinoma at the State University of Iowa Hospitals is discussed in the second part of this paper.

Patients in stage 1 and stage 2A of the modified Heyman classification (see table) were treated by abdominal hysterectomy and bilateral salpingo-oophorectomy. Au 198 was given intraperitoneally on the fifth to the tenth postoperative day in doses of 150 to 200 millicuries of colloidal gold, in an attempt to destroy previously discussed early desquamation of malignant cells in prognostically favorable cases. These patients had no x-ray therapy since no tumor was left behind at which x-rays could be directed. In patients with stage 2B, 3, and 4 carcinoma, as much carcinoma was removed as possible and followed by external irradiation. If possible, radioactive gold was used, especially in patients with good physical condition.

Between February 1951 and March 1955, 66 patients received radioactive gold after surgery, and 49 received external irradiation in addition. The pathologic findings were: papillary serous cystadenoma in 25 patients, pseudomucinous cystadenoma in 7, adenocarcinoma in 27, anaplastic carcinoma in 6, granulosa cell carcinoma in 1. The technique of administration of colloidal gold is described in detail. Eight patients received a second injection within 2 to 7 months. The use of polyethylene tubing left in situ at the time of surgery was discontinued because of the formation of adhesions that trapped the radioactive material, and because of leakage around the tube. Most reactions were of a mild nature, or traumatic (ulcerative necrosis of the abdominal wall in one case, and a fecal fistula with ileus in another). In two instances exploratory laparotomy was required for a chronic adhesive peritonitis with thick edematous adherent bowel. In other cases of consecutive incidental laparotomy, the only evidence of intraperitoneal gold therapy was a metallic sheen over peritoneal surfaces. It is believed that radioactive gold disappears within 24 hours after its application.

TABLE I.—MODIFICATION OF HEYMAN'S CLASSIFICATION OF OVARIAN CANCER

Stage 1:	Surgical removal of all the primary tumor and all visible metastases.
Stage 2A:	Ascites with malignant cells or malignant cells spilled into the peritoneal cavity at operation.
Stage 2B:	Partial or total removal of the primary lesion, but visible metastases remaining.
Stage 3:	Recurrence of malignant tumor following either operation or irradiation.
Stage 4:	Inoperable tumor; exploratory or paracentesis only, distant metastases.

The time elapsed since the institution of this treatment was too short to permit evaluation of the end results. It is believed, however, that for carcinomas in stage 1 and 2A, surgery in combination with radioactive gold will improve the usual 50 per cent 5-year survival. Ten out of 12 patients in this group are alive and well 2 years after treatment. Three out of 41 patients in stage 4 with extensive spread are alive and well after 2 years, and 7 after one year. Ascitic fluid formation appeared to have diminished after gold therapy in about half the cases. Patients in serious condition did not receive gold.

In the discussion, it was brought out that treatment with radioactive gold is palliative only, but palliation is greater than that obtained with roentgen therapy. Radioactive gold may not be able to destroy larger neoplastic implants since its beta radiation does not penetrate more than about 6 millimeters.

—*W.D. Bergman, M.D.*

Torsions of the "Healthy" Tube (Torsions de la trompe "saine"). G. CORDIER, L. QUENU, and H. GARNIER. *Presse méd.*, 1956, 64: 557.

IN 1931, REGAD emphasized the rare incidence, difficult diagnosis, and obscure etiology of torsion of the healthy tube, and urged that all cases encountered be published. He found only 23 per cent of cases of adnexal torsion involving healthy tubes. Torsion of the healthy tube occurs almost always in the period of genital activity.

Various criteria for determining the previous integrity of a twisted tube are presented. Slight intraperitoneal oozing of the blood is more frequent than in the torsion of diseased adnexa. Histologic examination furnishes the chief diagnostic criterion by exclusion of signs of inflammation, malignancy, or chorial villosities. Pathologic examination reveals infarcts at the level of the tube with adjacent inflammatory reaction, the histologic nature of which has not been determined. Thus, the clinical history, the condition of the opposite adnexa, and the absence of cystic lesions of the ovary in the specimen examined would seem the only criteria for a diagnosis of torsion of the healthy tube.

Various theories as to the mechanism of torsion have been offered, including anatomic predisposition, hemodynamic and anatomic conditions such as persistence of the fetal anatomic spiral type, and spasmodic factors. The mechanism of torsion remains obscure. The frequent coincidence of torsion with the premenstrual period is emphasized by all workers with this condition. Dysfunction of the sympathetic innervation of the tube has also been suggested. There appears to be some truth in all of these theories. Anatomic differentiation from torsion of pathologic

adnexa is clinically impossible. There seem to be acute and chronic forms of torsion, with iliac, pelvic, or, more rarely, lumbar pain in crises during or outside of the menstrual period, but most usually directly before the period or a few days after. There may be slight metrorrhagia and there may be intervals of months or years without symptoms, so that a careful anamnesis is necessary. Dysmenorrhea is less constant but the periods are never regular, a factor of significance in the differentiation from tubal pregnancy. Physical examination during subacute attacks is rarely of help in diagnosis. Occasional discovery of a laterouterine mass frequently leads to the diagnosis of cystic ovary and operation. In acute torsion the pain is atrocious, often leading to syncope. It is usually iliac at first with multiple radiations, especially to the lumbar region. Renal colic is a common mistaken diagnosis. Symptoms of gastric involvement may mask the condition. When the pain subsides somewhat it is frequently located in the hypogastrium or iliac fossa. Vomiting may persist for 24 hours and then subside. Initial diarrhea may be followed by the arrest of food and gas in the intestines. Also urinary disturbances have been noted, and occasional metrorrhagia. Associated conditions may be appendicitis or pregnancy. The course is benign in spite of the severe symptoms. No deaths have been reported. In addition to the symptoms mentioned by Regad, namely, attacks of pelvic pain near or during the period, rapid pulse with a normal temperature, a laterouterine mass which is movable and painful to touch, and the absence of pathognomnic signs of tubal pregnancy, there are two other symptoms, metrorrhagia and uterine attraction to be considered.

Treatment consists in isolated or associated simple salpingectomy, adnexectomy, or hysterectomy because in one of two cases reported there was a coincident myoma and in the other the age of the patient was advanced. —*Edith Schanche Moore*

MISCELLANEOUS

Treatment of Rectovaginal Fistulas Following Radium Therapy of Cancer of the Cervix (Traitement des fistules recto-vaginales survenant après radiumthérapie du cancer du col). MARCEL DARGENT and PIERRE CHAPUIS. *Sem. hôp. Paris, Ann. chir.*, 1956, 32: 79.

THE AUTHORS report a series of 24 cases of rectovaginal fistula following radium therapy of cancer of the cervix. The age incidence, from 40 to 55 years, was about the same as for the latter. By far the most cases developed after associated radium and roentgen therapy, which was the routine treatment from 1927 to 1947 at this hospital. The fistulas developed from 6 months to 20 years after treatment. In addition to the recent fistula appearing in still edematous tissue in an area of subacute perirectitis, there is the later type always associated with constriction in an area of scleroinflammatory perirectitis (frequently very thick). Only in very late fistulas is the constriction in the form of a diaphragm. In 4 of the 24 cases a rectal fistula coexisted or preceded a vesical fistula. In 2 of these 4 cases the urinary fistula developed after attempted surgical treatment of the intestinal fistula. Faults in the technique of radium therapy and in particular in the dosage to the rectal walls on account of slipping or twisting of the colpostat are frequently to blame. Preexisting vascular inflammatory lesions have also been mentioned as predisposing factors. In 14 of the 21 histologically studied specimens in the present series there were obliterating arteriolar or capillary lesions.

The chief problem in fistulas appearing after the sixth month is that of diagnosis of their nature. Biopsy is not to be recommended because (1) it is frequently misleading since there may be both inflammatory and malignant tissue and the results will depend upon which happen to be included, and (2) biopsy may be dangerous since it constitutes a traumatism of necrotic tissue that may lead to spread of the necrosis. Palpation will reveal considerable homogeneous thickening of the rectal sheath, and rectoscopy reveals hyperplastic rectal mucosal proliferations along the margins of the fistula. Cervicovaginal examination may also yield important information. Should examination of the irradiated cervix or vaginal dome show active persistent malignancy, the fistula may be malignant. This would justify an indication for partial posterior pelvic exenteration, or even total exenteration if the bladder is involved. If the lesions are purely dystrophic with no signs of malignancy, conservative measures are in order. However, deliberation is necessary, especially in relatively early fistula in edematous rectal tissue in which constriction has not yet developed. In difficult cases it is justifiable to suggest a test treatment with left colostomy for 4 to 6 weeks, when it will be clear whether other measures will be needed. Of the 24 cases in the present series, 5 were lost sight of, and in the 19 others only one error was committed. In this case an early fistula following radium therapy and lymphadenectomy; the cervix and vaginal dome had not been sterilized. The fistula developing in the third month appeared to be dystrophic, but its further course proved it to be malignant; if this had been recognized in time a posterior pelvic exenteration might have been done.

In this series, 4 patients were lost sight of, and 4 recovered spontaneously. In 3 patients a left colostomy only was performed. In the 13 other patients operation was performed on the fistulous rectum. In 5 of the latter a left colostomy was done. In 4 patients no colostomy was performed, but a simple resection of the fistulous rectum was done by the transvaginal route and with transanal depression. The results were excellent in 2 cases. One patient complained of the escape of gas, and in the last case results were poor and a vesical fistula developed 2 months later. The patient was left with rectal incontinence that interfered with her sexual activity. In 4 patients a vesical fistula developed because of secondary necrosis, and in addition to left colostomy and resection several attempts at radical or palliative treatment were made. Resection of the diseased rectal segment was the treatment of choice. More radical procedures are justifiable only in large actively malignant fistulas ulcerating the rectal wall to the anal canal. Partial pelvic exenteration with permanent colostomy is indicated.

The selection of the proper time for intervention may present difficulties, as it may be difficult to ascertain whether malignancy persists or to determine

whether the fistula might not be expected to close spontaneously. In late fistula there is no such probability and operation is indicated. The prognosis is less certain in early fistula. Early intervention would appear justified in fistulas developing shortly after operation on the pelvic sympathetic nerve to relieve pain. Spontaneous closure should be awaited only in very small fistulas located relatively high up in the rectum. In the most frequent type of fistulas developing between 6 months and 3 years, a preliminary colostomy is advisable, then a period of several weeks of waiting to determine whether intervention on the rectum will be required. Colostomy may suffice in itself for a small fistula, but it is a necessary preliminary procedure to operation in a large fistula, as in cases in which coloanal or colorectal depression has failed. Derivation is then done in preparation for reoperation.

There are three routes of approach, to be considered, most authorities favoring the abdominoperineal route. The abdominal route is recommended for all patients in good general condition when presenting a large fistula, and for patients with the stricture extending far up with considerable infiltration of the rectal sheath. For the perineal stage, the transvaginal route is best.

The transanal route is justifiable only when resection cannot be done and an actual amputation must be performed, including the anal mucosa. The transsacral route affords excellent exposure but has two disadvantages; namely, it requires the Depage ventral position that may prove quite a shock following the abdominal stage, and if used alone without preliminary control of the ureters by the abdominal approach, it presents the risk of urinary fistula. The transvaginal route alone may be used in patients in whom the combined operation appears risky because of a relatively low fistula in an old stricture modified by sympathetic intervention and in which cleavage would thus appear relatively easy. Most failures are attributable to difficulties in mobilization of the rectosigmoid and to excessive traction on the sutures. In the present series a few cases seemed to justify reoperation with an abdominal stage.

In the treatment of associated urinary lesions, a unilateral ureteral fistula will require nephrectomy if the other kidney is sound. A bilateral ureteral fistula requires complicated and dangerous interventions. Thus, colpocleisis in the presence of persisting infected and necrotic lesions ends in failure. The abdominal route with liberation as complete as possible of the rectosigmoid, terminated by a transanal amputation and transplantation of the ureter into the lowered loop, results in incompetent sphincters. For this reason it is better to perform a rectal resection with termoterminal sigmoidorectal anastomosis and implantation of the ureter above in two stages. However, experience has shown that the sutures may give way with a resulting vulvoperineal fistula. However, colpocleisis on tissues thus relieved of necrotic and infected elements may succeed and transform the new perineal fistula into a sphincterized tube at the level of the anus. Furthermore, in instances of such complex lesions it might be better to do a colpohysterectomy and cystectomy.

A vesical fistula was the only one encountered in the present series, and an attempt to close it by the transvesical route was attempted with excellent results, only an intermittent tiny fistula being left. In the 3 other cases, colpocleisis failed. Von Massenbach has suggested opening one fistulous tract into the other in order to obtain a gut with a sphincter. Here, too, in severe cases, it might be well to consider pelvic exenteration from the start, with implantation of a loop of intestine into the lower rectum or mucosa of the anal canal, or producing a terminal iliac anus with cutaneous ureterostomy which the authors believe is preferable to a wet colostomy. Such difficult operations must, of course, be undertaken under the protection of a high colostomy. When one has good reason to believe that a fistula is purely necrotic and there are no urinary complications, every effort should be made to perform an operation that will conserve function.

—*Edith Schanche Moore*

OBSTETRICS

PREGNANCY AND ITS COMPLICATIONS

The Roentgen Diagnosis of Advanced Ectopic Pregnancy (Zur roentgenologischen Diagnose der fortgeschrittenen Extrauteringraviditaet). K. ZIMMER. *Geburtsh. & Frauenh.*, 1956, 16: 197.

BESIDES PURELY CLINICAL MEANS of diagnosis there are other methods of detecting advanced ectopic pregnancy. These consist of the injection of pituitary extract and looking for uterine contractions, careful curettage, and roentgenographic means. With x-rays one may utilize routine flat plate technique, soft tissue technique, or hysterosalpingography.

Of greatest advantage is the soft tissue technique. This will show positive findings from about the fifth month on; the usual soft tissue shadows of the uterine wall and the placenta are absent. Hysterosalpingography is unsafe in questionable cases after the fifth month.

The author outlines the case history of a 43 year old gravida 3 para 0 with a 6 month abdominal pregnancy. At laparotomy, the fetus and placenta were removed; the left adnexa were excised because of bleeding.

—*Warren R. Lang, M.D.*

Experiences with the Roentgen Diagnosis of Placenta Previa (Erfahrungen mit der Roentgendiagnostik der Placenta praevia). KARL ZIMMER. *Geburtsh. & Frauenh.*, 1956, 16: 191.

THERE ARE two general approaches to the roentgenographic determination of placenta previa: direct by contrast media (placentography) and indirect methods.

Contrast media are more significant experimentally and have been used only infrequently in human beings. Radiopaque material is injected intravenously into the aorta or femoral artery and films are taken. These methods are not without danger. It would be desirable to have some medium which would have a specific affinity for the placenta, but as yet such a medium is not available.

Indirect methods consist of soft tissue technique outlining the placenta by a "thickening" of the uterine wall, and cystography for which radiopaque dye is inserted into the bladder, with the distance between the head and bladder increased in placenta previa and the fetal head displaced on routine films. In the author's opinion, no one method is satisfactory. A combination of the various indirect methods gives the safest and most accurate results.

—*Warren R. Lang, M.D.*

The Therapy of Eclampsia (Zur Therapie der Eklampsie). H. KYANK. *Geburtsh. & Frauenh.*, 1956, 16: 109.

THERE is no doubt that the lowered incidence of eclampsia is directly related to better prenatal care. This trend, noticeable in the world literature, was also evident in the clinical material of the University of Leipzig Women's Clinic where eclampsia was encountered 385 times (0.7 per cent) in more than 58,000 deliveries during the years 1937 to 1953. Eclampsia occurred five to six times more frequently in multiple than in single pregnancies, and about four times more often in primiparas than in multiparas. Of the cases 28.4 per cent occurred antepartum, 35.8 per cent intrapartum, and 35.8 per cent postpartum. The maternal mortality in these 385 eclamptics was 11.7 per cent (corrected 8 per cent) and, according to time of onset, was 11, 5.12, and 8.7 per cent, respectively, (corrected in the ante-, intra-, or postpartum periods). The maternal mortality (corrected) increased from 2.4 per cent for those with one to four convulsive attacks (250 patients) to 55 per cent for those with more than 15 attacks (20 patients).

Routine treatment of eclampsia consisted of intramuscular injections, an initial injection of 0.02 gm. of morphine hydrochloride and injections of 0.4 gm. of sodium luminal every 4 hours. In addition 100 ml. of 40 to 50 per cent glucose in water were injected intravenously every 2 hours. Under this treatment 62.4 per cent of 237 antepartum and intrapartum eclamptics who had had convulsions before admission had further attacks more than 30 minutes after the institution of therapy. Thirty of these 237 patients (12.6 per cent) died, 90 were delivered by forceps or extraction with a 5.6 per cent mortality, and 129 were delivered by cesarean section or vaginal hysterotomy with a 17.8 per cent uncorrected mortality. Of those delivered by cesarean section 23.2 per cent had further convulsive attacks after operative delivery.

The high rate of surgical intervention indicates the relative failure of conservative management, even though nearly all of the 23 deaths after cesarean section occurred in women with very severe eclampsia. When the operative delivery was done after 1 to 4 eclamptic attacks the corrected mortality in 86 cases was 2.3 per cent, as compared with 23.3 per cent in 43 patients with more than 5 attacks prior to surgical intervention. There was no death in a group of 23 patients who had cesarean section within an hour after their first attack in the hospital. The maternal mortality and fetal loss were higher in older women and multiparas than in younger women and primiparas.

As to the total number (412) of infants the perinatal mortality was 18.9 per cent, and it was highest (37.7 per cent) among the women with antepartum eclampsia. The fetal mortality of full term infants delivered by cesarean section was lowest among the women who could be operated upon early, and fetal loss increased with the maternal age and the amount of proteinuria present. The rate of prematurity increased rapidly with increasing maternal age (over 35 years).

A review of the recent world literature (with 143 quotations) resulted in a recent reorientation of conservative treatment in Leipzig with a withdrawal from methods similar to the Stroganoff schedule. A new sedative-hypotensive management has recently been employed with magnesium sulfate, megaphen (a drug used for artificial hypothermia), and nepresol (similar to apresoline). Calcium gluconate or chloride, and caffeine or theophylline were available as antidotes

during this treatment. None of the 14 patients treated in this manner had further eclamptic attacks after 30 minutes of therapy. While this number is not statistically significant, no death has occurred in this group.

In summary, it appears that progress in the conservative management of eclampsia permits the obstetrician to await forceps delivery in intrapartum and less severe antepartum eclampsias, provided there is no fetal distress. When the child is wanted badly or if other indications are present, cesarean section might be justifiable even though 50 per cent of these section babies in antepartum eclampsia can be expected to be premature. In the severe case in which the hazard of further operative insult to the liver, kidney, or brain has to be weighed against the necessity of emptying the uterus immediately, the decision to resort to cesarean section may be extremely difficult. The present author favors conservative treatment and the induction of labor once the convulsive state is under control. He realizes, however, that in smaller institutions, immediate section (if possible after the first attack) will be safer for the mother and infant than an inadequate conservative regimen or time-consuming transfer to a large hospital. —*W. D. Bergman, M.D.*

Late Pregnancy Bleeding and Rupture of the Marginal Sinus. JAMES HENRY FERGUSON. *N. England J. M.*, 1956, 254: 645.

NOT UNAWARE of the reluctance of many to accept the reality of this rather old entity, the author summarizes his experience of the past 3.5 years at the Charity Hospital, New Orleans, with 51 instances of marginal sinus rupture in normally implanted placentas. Patients with late-pregnancy bleeding in whom placenta previa was excluded by vaginal examination, and whose clinical courses were rather mild for abruption, constituted the group in which the diagnosis was suspected. Final diagnosis was made only upon examination of the delivered placenta. None of the characteristics of abruption were present. These include indentation of the maternal surface adjacent to the clot, discoloration, alteration of the surface texture, and the presence of abruption clot. Before making the diagnosis the author insisted on finding a clot at the margin of the placenta, which was continuous with the clotted blood within the marginal sinus.

Toxemia was present in 14 per cent of these 51 patients and this incidence is to be compared with a 19 per cent overall incidence on the service. The onset of bleeding occurred at about the time of the onset of labor. In 19 cases, the bleeding preceded labor, and in 26 it began during the first stage of labor. Eight patients believed the two events began simultaneously. The bleeding was regarded as painless in all. In volume, the bleeding was moderate. Only 5 patients had an estimated loss in excess of 500 milliliters. Twleve patients lost less than 100 milliliters (estimated). All were delivered vaginally. If blood loss is great, it is believed that cesarean section may become necessary regardless of the suspected diagnosis.

There was only one stillbirth. Forty-five per cent of the babies weighed less than 2,500 grams. The median length of gestation was 36 weeks. This high incidence of prematurity led the author to speculate that preternatural uterine activity might have caused the sinus to rupture or, vice-versa, the rupture and escape of blood might have induced premature labor.

The importance of the entity was statistically established by a six-month study of all late-pregnancy bleeders. Thirty-four per cent of 97 patients were found to have marginal sinus rupture. Abruption of the placenta was present in 13 instances and placenta previa in 6. —*Everett Shocket, M.D.*

Congenital Heart Disease Associated with Pregnancy; a Study of 53 Cases. JORGE ESPINO-VELA and DIRSON CASTRO-ABREU. *Am. Heart J.*, 1956, 51: 542.

FIFTY-THREE CASES of congenital heart disease associated with pregnancy were studied. There were 28 cases of patent ductus arteriosus, 13 cases of atrial septal defect, 6 cases of coarctation of the aorta, 2 cases of ventricular septal defect, and 1 case each of the following tetralogy of Fallot: dextrocardia with situs inversus, pulmonic stenosis, and aortic stenosis.

When the analysis of the cases was made, the influence of pregnancy on the malformation, and the tolerance of the heart to the combined effects of both factors were borne in mind. Accordingly, an estimation of the tolerance was made in each case prior to pregnancy and postpartum.

In this series there were 4 deaths directly attributable to pregnancy. Three occurred in patients with patent ductus arteriosus, 2 of whom had a window type ductus. The other one occurred in a patient with an atrial septal defect.

No complications worthy of mention were seen among the cases of coarctation of the aorta.

In cases of patent ductus arteriosus, the size of the ductus would appear to be of primary importance, as this is ultimately expressed in magnitude of blood flow through the ductus. Should this flow be excessive, cardiac reserve is threatened when a new arteriovenous fistula, the placental, is added. This latter fistula adds its adverse effects to those of the ductus. The authors believe that a window type is of greater hemodynamic consequence than the true ductus.

In atrial septal defects pregnancy seems to tax cardiac reserve when, due to the presence of the malformation, the right cavities suffer considerable overloading during pregnancy, at which time the arteriovenous shunt is reversed, with all its unfavorable consequences.

Cyanotic patients should be given encouragement in their outlook. Such patients can lead a nearly full life after operation. In the present series all patients, with exception of the one with aortic stenosis, tolerate their malformation very well. The malformation in the mother seems to have very little, if any, effect on the infant; many of these patients have had numerous pregnancies. One patient with patent ductus (who experienced greater difficulty than any of the living patients of this series) has never again become pregnant although no contraceptive measures have been used for a period of 3 years. The patient who died of atrial septal defect gave birth to an unusually small infant with a very small and abnormal placenta. Fifteen patients among the 51 had one or more abortions. Only 2 of these had positive syphilitic reactions.

Bacterial endarteritis was encountered three times in cases of patent ductus arteriosus and one of these

patients died as a direct consequence of this complication after childbirth.

Pregnancy per se, if the condition of the patient is not critical and yet merits an operation, is not a normal contraindication for surgery. One of the patients with patent ductus arteriosus was operated upon during the second month of her fourth pregnancy. The postoperative course and delivery were uneventful.

Eleven patients in this series have been operated upon—9 with patent ductus arteriosus, 1 with atrial septal defect, and 1 with the tetralogy of Fallot. Practically all of the patients could be included among candidates for surgery for the correction of their heart malformation, either partial or radical.

Cesarean section, with the exception of aortic coarctation, has very limited indications and should be reserved for obstetric problems.

Tolerance to the congenital malformation prior to pregnancy is a useful guide in the prognosis of the pregnant period. —*John R. Wolff, M.D.*

The Effect of Pregnancy on the Course of Heart Disease; a Re-Evaluation of 106 Cardiac Patients Three to Five Years After Pregnancy. MARY M. MILLER and JAMES METCALFE. *Circulation*, 1956, 13: 481.

ONE HUNDRED AND SIX PATIENTS have been restudied 3.5 to 5 years (average 4.1 years) after they had been observed with pregnancy and heart disease at the Boston Lying-In Hospital. None died during pregnancy or in the puerperium and only 3 have died since; 92 patients have shown either no change or an improvement in functional classification.

This re-evaluation indicated that the altered circulatory dynamic of pregnancy may temporarily decrease the functional capacity; however, no permanent change in the degree of heart disease could be directly attributed to the pregnancy for which these patients were followed in 1950 to 1951.

—*John R. Wolff, M.D.*

Ulcerative Colitis and Pregnancy. BURRILL B. CROHN, HARRY YARNIS, EDWARD B. CROHN, ROBERT I. WALTER, and LESTER J. GABRILOVE. *Gastroenterology*, 1956, 30: 391.

A REVIEW of the literature reveals that pregnancy aggravates chronic ulcerative colitis of the nonspecific type. As far as can be ascertained, ulcerative colitis has no deleterious influence on the course or outcome of pregnancy.

One hundred and fifty pregnancies in women with nonspecific ulcerative colitis were analyzed. These patients were divided into four groups for the purpose of analysis. Group 1 consisted of those patients who had previous ulcerative colitis which was healed and quiescent at the time of the onset of the pregnancy; group 2 contained those patients with active colitis at the onset of pregnancy; group 3 included those patients who first developed ulcerative colitis during pregnancy; group 4 included those patients who developed colitis in the postpartum period, some of them quite late postpartum.

In the first group, 52 per cent developed a recurrence either during pregnancy or postpartum. In the vast majority, the condition occurred in the first trimester. The second largest number of recurrences was in the immediate puerperium. In the second group, 75.3 per cent of the patients showed aggravation of the disease, again a large percentage in the first trimester and in the postpartum phase. In the third group, in which the first attack of ulcerative colitis occurred during pregnancy, 10 out of 19 patients became ill during the first trimester, and in 13 out of 19 cases the condition was extremely severe with the one fatality in this particular group. This confirms the opinion in the literature that ulcerative colitis beginning during pregnancy is particularly dangerous. In the last group, 6 of the 19 cases occurred in the immediate puerperium; the remaining 13 occurred a month or longer postpartum. There is some question as to whether the disease in these cases should be related to the pregnancy.

In spite of the fact that nonspecific ulcerative colitis is a severe chronic disease with considerable disability to the patient, it is rarely fatal except in those cases in which it begins during pregnancy. In view of this it is generally accepted that the disease should be treated medically and the pregnancy carried to term. The fact that the course of pregnancy and the outcome of the infant is apparently not affected by the disease certainly would encourage this. The patient should be treated symptomatically, with transfusions adequate, a highly nutritious diet, accessory food factors, and antibiotics. In addition, the disease responds fairly well to ACTH in moderate dosage. Since many of the reported cases in the literature occurred prior to the availability of ACTH and antibiotics, it is possible that the results in the management of this disease in the future will be considerably improved. The influence of continuous dosage of ACTH on the infant was not mentioned. The psychosomatic aspects of the disease were considered. The authors pointed out that in some of the cases in which exacerbation of the disease occurs during pregnancy, a strong desire for pregnancy may play an important role. On the other hand, the reverse may be true in those cases in which the disease becomes worse.

Since ulcerative colitis is a controllable disease, and in view of the very high percentage of patients in group 2 who become worse when pregnancy occurs, it would seem advisable to advise against pregnancy until the disease is quiescent. In group 3 the severity of the disease and the poor prognosis suggests that therapeutic abortion may be indicated in some of these patients. There is no indication to alter the obstetric management of the patient. Although surgical procedures have been performed there is no contraindication to normal labor.—*James F. Donnelly, M.D.*

Addison's Disease and Pregnancy (Maladie d'Addison et grossesse). L. DE GENNES, H. BRICAIRE, J. HAZARD, and E. BEAULIEU. *Presse méd.*, 1956, 64: 689.

IN SPITE of the general belief that women with Addison's disease remain sterile, they do become pregnant, and not too rarely, and if hormone treatment is carefully administered to them, the pregnancies should go on to term, normal labor, and the birth of normal children.

The authors base their study of the problem as a whole on the effect of the disease on the genitalia and

the effect of the pregnancy on adrenal insufficiency in a series of 4 cases which are described in detail. They note two critical periods during pregnancy, namely, one in the first trimester associated with frequent vomiting, and the other in the terminal period in the form of shock due to labor, which resembles surgical stress. In the interval between these two periods, the patient's conditon appears to be improved by the pregnancy, and frequently to such an extent that hormone therapy may be temporarily suspended. After studying the possible adjuvant role of the fetal suprarenal cortex, the authors conclude that this cortex plays a very small part in the improved condition of the patient, which appears rather to be related to an afflux of steroids of placental origin. From studies of this type it has become possible to determine more exactly the indications for hormone treatment and the proper dosage, so that pregnancy may be brought to term without ill effects.

It is concluded that in Addison's disease, the progestational and estrogenic functions of the placenta are practically normal. ACTH induces no steroidogenic effect. The 17-OH corticoids are missing, while the reductor corticoids and the Gornall type of corticoids are increased as in the pregnancy of normal women. The production of biologically active hormone substances has been demonstrated, in the existence of unidentified y-ketols in chromatograms. These are probably secreted by the placenta.

In the early period of frequent vomiting, the equilibration doses of cortisone should be doubled (40 to 50 mgm.) and an intramuscular injection of 5 mgm. of doca should be administered daily. In cases of severe vomiting, the patient must be looked upon as being in danger of acute suprarenal insufficiency and the dose of cortisone should be increased 100 to 300 mgm. in 24 hours, and the dose of doca 10 to 30 mgm. a day, and these are to be given together with isotonic saline infusions. Such treatment is possible, however, only when constant surveillance is possible. If not, it is best to adhere to the standard treatment. Labor and delivery are dangerous and may suddenly, without premonitory symptoms, throw the patient into acute suprarenal insufficiency. For this reason the patient should be considered from the first signs of labor until 2 or 3 days thereafter as a person with suprarenal insufficiency who is to undergo a surgical operation. During this entire danger period she should receive increased hormone doses, up to 300 mgm. of cortisone and 10 to 20 mgm. of desoxycorticosterone daily. If these precautions are observed fatalities may be prevented. —*Edith Schanche Moore*

Pregnancy and Diabetes Mellitus; a Clinical Study. LARS HAGBARD. *Acta obst. gyn. scand.*, 1956, 35: Supp. 1.

THIS VERY EXTENSIVE REVIEW of the general subject of diabetes and pregnancy includes a thorough review of the literature. Two series of patients from the same institution provide the clinical material for the study. The maternal complications and mortality are compared both from the viewpoint of diabetes and of pregnancy. The fetal mortality and morbidity are discussed. The first series of clinical cases presented was observed in the years 1948 to 1951, during which the management of the diabetic patient was somewhat haphazard, and the second series was observed during the years 1951 to 1954, at which time the method of management of the diabetic patient was agreed upon by all institutions and followed quite closely. The better clinical results in the second series led the author to certain conclusions concerning the management of the diabetic pregnant patient.

Many of the conclusions drawn from the study are similar to those held in North America. In the more recent series in which the diabetic regimen was more closely controlled, the incidence of insulin reaction was more common. The author noted, however, this seemed to exert no ill effect on the outcome of the pregnancy in contrast to diabetic coma, or pre-coma, which definitely increased the mortality risk for the fetus. The incidence of toxemia was noted to be 40 per cent in the most recent series, somewhat lower than in the previous series noted. Polyhydramnios occurred in 26 per cent of the patients and greatly exceeded the normal expected incidence. Acute infections were common and posed a problem in the management of the diabetes as expected. In the early series the patients were delivered vaginally unless abdominal delivery was indicated by some obstetric reason. However, in the later series premature interruption of the pregnancy, in most cases by cesarean section, was selected as the mode of termination. Maternal mortality and morbidity associated with cesarean section appeared lower than with vaginal delivery, although one maternal death was definitely associated with cesarean section. In general, the insulin requirements fell in the puerperium; this was more marked following cesarean section, with a large number of the insulin reactions occurring during the puerperium.

The most marked difference in clinical results was noted in the fetus. The perinatal mortality in the early series was 44.5 per cent as opposed to 26.2 per cent in the later series. This result applied predominantly to the fetal factor of perinatal mortality, with the neonatal mortality remaining about the same. Among the factors which appeared important in the fetal outcome, diabetic coma has already been mentioned. In addition, toxemia appeared to increase the risk with the fetus, although this was slight. On the other hand, polyhydramnios was associated with a marked increase in fetal loss even when the malformations were removed from the data. The duration and degree of the hydramnios likewise seemed to be factors. Malformation occurred in 6 per cent of the total 467 diabetic pregnancies, or six times the expected incidence. The risk of congenital deformity did not appear to be related to the severity of the maternal diabetes; however, a correlation did exist between malformation and polyhydramnios, which would be expected.

The author felt that the time of delivery was the most important factor in the outcome of the fetus. On the basis of expectancy curves, it was determined that the infant's best expected survival rate was between the thirty-sixth and thirty-seventh week. Delivery before that time involved the problem of prematurity and, following it, an increased number of stillbirths.

In summary, the results appeared to be better, particularly in the primiparous patients, where complications of delivery would increase the fetal loss. The neonatal losses were primarily due to prematurity.

Early studies indicated that the administration of hormones was of no value in ameliorating the diabetes.

The following general recommendations were made:

Careful medical antepartum care including meticulous care of the diabetes with avoidance of diabetic coma. Diabetic coma appeared more common the second half of pregnancy and immediate hospitalization was recommended if it threatened.

If polyhydramnios developed hospital admission was considered mandatory, and if the fetus was viable interruption of the pregnancy was considered.

If the diabetic patient progressed normally, hospitalization was carried out in the thirty-sixth to thirty-seventh week and most patients were delivered at this time by means of cesarean section.

The occasional multiparous patient, with the necessary conditions present for induction, was delivered vaginally.

Prophylactic antibiotics were given during the puerperium to avoid infection. The infant was treated as premature and was placed in a special nursery. The infants were begun on glucose solutions orally soon after birth. —*James F. Donnelly, M.D.*

LABOR AND ITS COMPLICATIONS

The Problem of Cesarean Section (Das Kaiserschnittproblem). B. Belonoschkin. *Muench. med. Wschr.*, 1956, 98: 222.

The author discusses the problems connected with cesarean section in the light of nearly 12,000 sections performed by this group in Sweden during the years 1926 to 1953. The figures quoted in this abstract relate to the earliest reporting period (1926 to 1930) and to the last two years of the report (1952 and 53). In Sweden, free prenatal clinics and free hospitalization and delivery are available to every patient. A total of 97 per cent of all deliveries take place in hospitals. In the author's hospital, 3 to 14 cesarean sections are performed in a total of about 4,000 deliveries per year, an incidence of less than 0.35 per cent, but this figure shows a tendency to increase.

For the purpose of comparison, the author collected (in an incomplete survey of the world literature from 1909 to 1953) 114,320 cesarean sections among over 9 million deliveries, an average incidence of 1.27 per cent. In Sweden, among 11,642 cases, the section incidence rose from 0.25 to 1.23 per cent during the reported period. The material is divided into four groups.

The first group contains 3,133 "clean cases" of cephalopelvic disproportion and repeat sections, where mother and infant have an optimal prognosis. Repeat sections have increased from 1 to 27 sections per year in a period of 28 years. The maternal mortality in this group decreased from 3.96 to 0.43 per cent, and the fetal loss was about 1.6 per cent in 1953. Delivery from below was attempted when the original indication for primary section was of a temporary nature.

The second group (1,678 cases) consists of toxemias, which now constitute about 10 per cent of all sections. The maternal mortality decreased from 16 per cent to 7.9 per cent, while the fetal salvage is still less than 85 per cent. In this group, prenatal care will have the highest prophylactic value.

The third group (2,237 cases) consists of those patients who underwent cesarean section for bleeding in the second half of gestation. Placenta previa was the indication for 16.3 per cent of all cesarean sections in the years of 1952 and 53. The maternal mortality decreased from 8.2 to 2 per cent, although the infant mortality is still close to 10 per cent. The operative maternal mortality among sections for abruptio placentae is in the range of 2.5 to 3.0 per cent, and the fetal salvage is only about 60 per cent, prematurity being an important contributing factor.

The fourth group contains all the remaining miscellaneous indications for cesarean section. Diabetes was an indication for section in 0.4 case per year in the late twenties and an indication for section in 68 cases in 1953. Fourteen of approximately 12,000 sections were done for Rh-immunization. In the total number of sections annually in this group, which has increased tenfold during the period of this report, the original maternal mortality of 11.7 per cent has dropped to 0.68 per cent, and the fetal mortality to 5.5 per cent.

While the maternal mortality in the collected material from the world literature was 4.75 per cent before 1938 (8.5 to 9.5 per cent in Sweden) it improved to 1.79 per cent from 1939 to 1953 (1.3 to 2.57 per cent in Sweden), certainly due to the general adoption of a low cervical technique, blood transfusions, antibiotics, and better anesthesia. The employment of extraperitoneal section in cases of infection also contributed to this progress. It is suggested that the incidence of cesarean section with its seemingly irreducible risk of complications and dangers can be lowered by good prenatal care, prophylaxis against rickets in childhood, the avoidance (or prompt treatment) of genital infections which might favor low implantation of the placenta, and by encouraging early marriage in order to avoid the obstetric problems of the elderly primipara. —*W. D. Bergman, M.D.*

MISCELLANEOUS

The Fetal Prognosis in Toxemias of Pregnancy and in Chronic Nephritis with Particular Reference to Therapeutic Abortion (La prognosi fetale nelle tossieme gravidiche e nella nefrite cronica con particolare riguardo al problema dell'aborto terapeutico). Piero Bailo and Paolo Toschi. *Minerva gin.*, Tor. 1956, 8: 68.

The authors report the cases of 553 infants born of mothers suffering from hypertensive toxic renal disease, chronic nephritis, pre-eclampsia, or eclampsia. Note is made of the high percentage of prematurity (25 per cent), the greater tendency toward twin birth (1 to 80), and the definite reduction in weight. On the other hand, fetal length did not differ from the normal. The neonatal prognosis improved in the cases of toxic hypertensive renal disease and chronic nephritis, both after spontaneous and surgical deliveries.

Therapeutic abortion was resorted to in 10.61 per cent from 1940 to 1944, and in 3.62 per cent from 1945 to 1949, but was not used from 1950 to 1954. The incidence of spontaneous abortion also increased. No maternal morbidity or mortality was reported. Included in this series were 52 cases of pregnancy complicated by toxic hypertensive renal disease, chronic nephritis, pre-eclampsia, and eclampsia.

A final resume tells us that 30 per cent of the patients delivered at term, 24.5 per cent at the ninth month, 20.41 per cent at the eighth month, and 15.11 per cent at the seventh month; 9.42 per cent aborted before viability.

The average weight of the infants from toxic mothers was 3,150 grams as compared to 3,250 grams for those delivered by normal mothers.

—*Vincent Ippolito, M.D.*

The Appearance of the Staphylococcus in the Natural Cavities of the Newborn as Related to Certain Conditions Intrinsic to Labor (La comparsa dello stafilococco nelle cavità naturali del neonato in rapporto ad alcune condizioni intrinseche al travaglio di parto). ENRICO FERRARIO. *Minerva gin.*, Tor., 1956, 8: 1.

THE NASAL AND RESPIRATORY PASSAGES of the newborn, as well as the gastrointestinal tract, are contaminated by the staphylococcus within a few hours after birth, as follows: 13 per cent at birth, 23 per cent at the end of 48 hours, 60 per cent by the fourth day, and 82 per cent on discharge.

The series studied comprised 88 infants. The positive or negative findings of the staphylococcus in the oropharyngeal and anal zones bear no relation to any particular condition intrinsic to labor, such as the mode of delivery, the duration of labor (dilating and expulsive periods), the time of rupture of the membranes, the latent period, or the fetal or neonatal distress.

The oral and nasal cavities are perfectly sterile when the membranes are intact, but they become contaminated when the fetal head passes through the parturient canal.

Direct contact between the fetal and maternal surfaces appears more responsible than any active inspiratory or swallowing movements of the fetus. Meconium rarely plays a role in this matter inasmuch as it is always sterile.

—*Vincent Ippolito, M.D.*

Stillbirth and Neonatal Mortality in Twin Pregnancy. W. J. R. ANDERSON. *J. Obst. Gyn. Brit. Empire*, 1956, 63: 205.

A SERIES of 397 twin pregnancies booked for delivery at Aberdeen Maternity Hospital, Aberdeen, Scotland over a period of 15 years is presented and the incidence of twinning is discussed.

The fetal death rate in the series of cases presented was 45.4 per 1,000 live births and was due principally to prematurity.

The neonatal death rate (122.2 per 1,000 live births) has fallen during the period of this survey. Part of this fall may have resulted from the war-time measures which helped to lower the overall stillbirth and neonatal mortality throughout Britain. Improved pediatric care has also been a factor.

The method used to deliver the child at birth has much less effect on the mortality rate than has the size of the baby at birth.

Twin pregnancy carries a high incidence of complications of pregnancy, especially pre-eclampsia, but the fetal mortality was as high or higher in the pregnancies in which there was no recognized complication.

Rest in the hospital antenatally appeared to help prolong the pregnancy but this influence could not be measured accurately and may have been of slight significance.

A relationship was demonstrated between maternal height, the combined weights of the babies, and the fetal mortality rates. The lower mortality in tall than in small women appears to be due partly to their being less prone to premature onset of labor and partly to the greater vitality of the babies. The incidence of twinning appears to be greater in tall than in small women, and this observation points to a correlation between the incidence of twinning and the state of nutrition of the mother, similar to that demonstrated in lower animals, especially the sheep.

—*John R. Wolff, M.D.*

GENITOURINARY SURGERY

ADRENAL, KIDNEY, AND URETER

Clinical and Pathologic Details of 2 Cases of Pheochromocytoma in Childhood. M. J. ROBINSON and ALAN WILLIAMS. *Arch. Dis. Childh.*, Lond., 1956, 31: 69.

THE AUTHORS record 2 cases of pheochromocytoma occurring in male children aged 8 and 10 years, respectively. The investigation of hypertension detected on physical examinations led to the diagnosis and removal of the tumors, and in each case the blood pressure reverted to normal levels and the symptoms were alleviated. These two case histories are presented in detail. In discussing their presentation they state that the clinical features associated with the presence of a pheochromocytoma are due to the secretion of adrenalin and noradrenalin by the tumor cells. Adrenalin is responsible for changes in metabolism but the absence of hyperglycemia and glycosuria in the above cases supports the contention that these changes are not frequently found in children. The secretion of noradrenalin is responsible for the hypertension which in children appears to be constant rather than paroxysmal. The use of regitine appears to be safe and affords valuable evidence of the presence of a pheochromocytoma. Further and conclusive evidence is afforded by the analysis of urine for catechol derivatives. This is done by biologic assay and, although time-consuming, is warranted in such cases. Preoperative localization was attempted by presacral air injection and by angiography. It is, however, impossible to localize the extra adrenal pheochromocytoma preoperatively, and from the recorded cases it is apparent that a high proportion of such tumors in children are situated in sites other than the adrenals. These extra sites are usually in the retroperitoneal tissue near the adrenals or are intermittently associated with the abdominal aorta and vena cava. The preoperative use of regitine together with the prevention of postoperative fall in blood pressure by use of noradrenalin appears to offer a degree of safety to exploratory and sometimes repeated operation. —*Robert O. Beadles, M.D.*

Pheochromocytoma with Sustained Hypertension. K. N. V. PALMER and G. A. MCDONALD. *Brit. M. J.*, 1956, 1: 957.

THE AUTHORS describe a case of pheochromocytoma which showed sustained hypertension, increased metabolism, impaired dextrose tolerance, polyuria, and albuminuria. After removal of the tumor the findings subsided. Only a quarter to a third of the cases present the classic picture of paroxysmal hypertension, and a sustained hypertension is seen more commonly. Other manifestations, uncommon in essential hypertension, are associated with sustained hypertension due to pheochromocytoma; these are generalized sweating, pallor and coldness of the skin, goose-flesh, unexplained fever, postural hypotension and tachycardia, a normal cold pressor test, and glycosuria. Phentolamine (regitine) is the adrenolytic agent of choice for diagnosis, because it is almost free of side reactions and will not produce a blood pressure rise in essential hypertension. During a normotensive phase, intravenous histamine will cause an abrupt rise in blood pressure. If a positive result is obtained with phentolamine or histamine tests, the urinary excretion of the catechol amines (adrenalin and noradrenalin) should be estimated; this is the most reliable diagnostic test for the presence of pheochromocytoma. The normal excretion of catechol amines is less than 150 micrograms per 24 hours; the authors' patient excreted 2,730 micrograms in 24 hours.

Reserpine (serpasil) when given parenterally produces a hypotensive effect in essential hypertension; the authors' patient did not have a blood pressure fall when 2 mgm. of reserpine were given intramuscularly; apparently, reserpine has no adrenolytic effect. The authors find that chlorpromazine has an adrenolytic and noradrenolytic action, and advocate its use as an alternative to phentolamine in the premedication of patients prior to surgical removal of a pheochromocytoma. Chlorpromazine may be effective in preventing a hypertensive attack during handling of the tumor. —*David Rosenbloom, M.D.*

The Upper Urinary Tract in the Paraplegic; a Long Term Survey. MARK DAMANSKI and NORMAN GIBBON. *Brit. J. Urol.*, 1956, 28: 24.

A REVIEW is presented of the status of the urinary tract in 116 paraplegics admitted to the Liverpool Regional Spinal Injuries Center since 1947, in an attempt to assess the long term prognosis. The incidence of such unfavorable developments as calculi, hydronephrosis, and ureteral reflux is tabulated together with other associated changes.

It is emphasized that in many of these cases (because of prior treatment and interest in plastic and orthopedic conditions) there was considerable delay in transferring the patients to the Center. In initiating a urologic survey, this delay, averaging from 4 to 13 months during the 1948 to 1954 period, must, in many instances, be held responsible for more severe and more rapid deterioration of the urinary tract.

In only 10 cases was the duration of paraplegia less than one year. In about 40 per cent of the cases (47 numerically), the duration was over 5 years. There were 25 deaths in this group, 16 of which followed uremia. In 12 of the 16 uremic patients there was an associated hydronephrosis, and in 5 renal calculi were present. In the entire series there were 17 patients with stones, almost all of whom were late admissions in the early years. In those patients who were stone-free on admission, calculi were found to have developed in only 6 after a period of 7 years. The authors believe that calculous formation in paraplegics could be virtually eliminated by prompt care.

Hydronephrosis was discovered in over one-third of the total number of cases; it was bilateral in 31 cases and unilateral in 14. In half of these the condition arose during a period of regular observation, being noted as early as 2 months or as late as 8.5 years. In

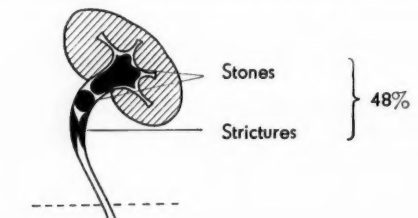

FIG. 1 (Karcher).

most cases the dilatation developed during the first 3 years. There was a high incidence of hypertonia and trabeculation of the bladder. In some cases dilatation developed during suprapubic drainage.

Reflux was observed in 26 instances. This condition was much commoner in high than in low lesions. It was previously noted by Bors who attributed it to loss of sympathetic innervation of the trigone and to relative hypertonia. There seems little doubt that back flow is harmful to the upper urinary tract. Here too, there was a high incidence of hypertonia and trabeculation and development in some cases despite free suprapubic drainage. The authors sometimes noted a saccule, described by Hutch, believed to destroy valvular action at the lower end of the ureter. They believe that operative procedures designed to restore the valve effect would be unsuitable in many of their neglected cases, and that the problem of ureteral reflux with its cause and effect is worthy of further research.

Suprapubic drainage was performed, or was present on admission, in 47 cases. This bladder drainage has been in effect from 2 months to 11 years, with an average duration of 19 months. Of these, 39 with normal upper tracts were closed. On three occasions deterioration of renal function followed. In one case a resulting bilateral hydronephrosis was temporary. A suprapubic cystostomy is compatible with maintenance of normal upper urinary tracts over a period of years and caution should be observed when closure is considered in such a case.

Delay in the admission of paraplegic patients for study of the urinary tract must be reduced to a minimum. Early study, treatment, and careful periodic follow-up examinations, as in vesical tumor, must be carried out. Stone formation, an important factor in the mortality rate, is largely preventable. Dilatation of the upper tracts in the early stages is reversible. It is necessary to impress upon patients prior to their discharge that their chance of survival may depend on their co-operation in follow-up visits.

—*Allan K. Swersie, M.D.*

The Indications for Permanent and Temporary Renal Fistulas in Obstructions of the Ureter and Renal Pelvis; Report of 75 Cases (Die Indikationen der permanenten und temporaren Nierenfistel bei harnleiter- und nierenbeckenverschluessen; Bericht uber 75 Faelle). G. KARCHER. *Langenbecks Arch. u. Deut. Zschr. Chir.*, 1955, 282: 967.

THE CLINICAL LITERATURE dealing with nephrostomy is as a rule concerned with operative technique rather than with indications. It is for this reason that the author reviews the indications for nephrostomy drainage in 75 cases. The indications for a nephrostomy may be primary or secondary. A nephrostomy is urgently indicated in urinary obstructions which are accompanied by uremia, anuria, and urosepsis. Whether or not a nephrostomy should be used will depend on the function of the kidney, the location of the block and its cause, and on the presence or absence of infection in the urinary tract. The duration and the type of blockage of the urinary tract also must be considered. In 48 per cent of the cases, the block was in the upper urinary tract and consisted of stone or strictures involving the pelvis or ureteropelvic junction; in 52 per cent the lower ureter was involved (FIG. 1). The author lists the indications encountered in the 75 cases as follows:

Urinary tract obstructions requiring nephrostomy

A. Low lying obstructions
   1. Tuberculosis in a lone kidney
      a. Low lying strictures of the ureter
      b. Contracted and scarred bladder
   2. Nonspecific strictures
      a. Inflammatory
      b. Postoperative
   3. Ureteral calculi
      a. Unilateral block of a solitary kidney
      b. Bilateral block
   4. Injuries of the ureter
   5. Megaloureter with a solitary kidney
   6. Ureteral stenosis due to malignant tumors
      a. Of the ureter and bladder
      b. Of the genitalia, large bowel, etc.

B. Upper urinary tract obstructions
   1. Caseous renal tuberculosis with block
   2. Nonspecific strictures
      a. Congenital
      b. Acquired
   3. Recurrent urolithiasis

The need for a nephrostomy is determined on the basis of history, the presence of fever or infection, and evidence of uremia in addition to tenderness of the affected kidney. Patients who have bilateral rapidly recurring stones can be improved by nephrostomy drainage which is allowed to remain for about 3 years. Infection can thus be combated and the tendency to form stones inhibited through frequent irrigations of the kidney. Twenty such patients in whom the kidney was drained for 3 years had a 10 per cent incidence of recurrence of stone, whereas in a control group the recurrence rate amounted to 35 per cent. Permanent nephrostomy may be necessary in inoperable tumors which obstruct the kidney, in solitary kidneys with block and diminished renal function, and in patients 50 years old or older, in whom nephrectomy is not

possible and the blocked urinary tract cannot otherwise be relieved. —*S. Richard Muellner, M.D.*

The Revascularization of the Kidney. YALE J. KATZ, DONALD W. HANNON, JOHN F. ALDEN, and IVAN D. BARONOFSKY. *Surgery*, 1956, 39: 623.

IN THE PAST the use of omentum, muscle, and spleen has resulted in vascular connections with the kidney, which, unfortunately, were limited in size and degree. Due to the vascularity of the intestine, it was felt by the authors that a more adequate accessory blood supply might result from fusion of the deserosalized gut to the decapsulated kidney.

Blind defunctionalized Roux-Y type loops of jejunum and colon were sutured to the kidney after stripping off the serosa of the intestine and the capsule of the kidney. A similar procedure was carried out between the duodenum and the kidney without interrupting continuity of the duodenum.

None of 27 dogs (46 fusions) died as a result of the operation. India ink injected into the intestinal artery appeared in both the renal artery and vein of animals with nephrojejunopexy and nephrocolopexy, while barium sulphate traversed the vascular channels only in the animals submitted to nephrojejunopexy. This phenomenon was observed as early as 2 weeks and as late as 65 days after operation, and indicates that vascular channels do develop and, once formed, they remain patent. To determine functional ability of the newly established blood supply, clamps were applied to the renal arteries in several of the animals, and indigo carmen was injected. The dye appeared in the urine from 5 to 11 minutes after injection, suggesting that the direction of blood flow is from the intestine to the kidney.

Accessory vascularization of the kidney in this manner may possibly have clinical application in nephrosclerosis, late glomerulonephritis and pyelonephritis, and possibly in obstructive renal artery disease.

—*Jack A. Thompson, M.D.*

BLADDER, URETHRA, AND PENIS

The Treatment of the Bladder in Paraplegia. J. COSBIE ROSS. *Brit. J. Urol.*, 1956, 28: 14.

THE AUTHOR discusses the problems and treatment of the bladder changes which follow traumatic paraplegia.

Immediately after the injury, there is bladder distention and a paralytic overflow-incontinence. The detrusor is paralyzed, the internal sphincter is tightly contracted, and the external sphincter is relaxed. This atonic neurogenic phase may last weeks or months. As the "spinal shock" subsides the patient develops an automatic or an autonomous bladder. The former, also known as a reflex bladder, occurs when the injury is above the unscathed micturition center. There is no control over voiding, which occurs at intervals of up to 3 or 4 hours; several ounces of urine are forcibly evacuated and varying amounts left behind. In the autonomous bladder, the center of micturition in the sacral spine has been destroyed and voiding depends on the precarious ineffective control of the nerve plexus in the muscular coat of the bladder. There is continuous dribbling. If transection of the cord has been partial, we have a voluntary neurogenic bladder with some degree of voluntary power. There is hope that voluntary micturition, although imperfect, may ultimately be achieved.

The aim of treatment is to make the patient ambulatory and free of urinary infection. The bladder should be emptied by involuntary reflex voiding at satisfactory intervals. Anything less may lead to infection and deterioration of renal function. In the initial atonic phase a long nonirritating polythene tube with a 1.5 to 2 millimeter lumen is used for bladder drainage in a closed system and may be left in situ for 40 days. Thereafter a small Foley catheter is used and changed once weekly. Details of technical management to avoid infection are described. Overdistention of the bladder or development of a small contracted bladder are thus prevented.

From time to time the catheter is removed for several hours to assess the degree of return of function. When the automatic stage is reached bladder training is begun. The catheter is released at regular intervals in the hope of stimulating the detrusor and securing a bladder which will retain six ounces without reflex evacuation. After catheter removal, the aim is regular evacuation by the clock. Fluids are given hourly between 7 o'clock in the morning and 7 in the evening; one aims at three hourly evacuations. Reflex micturition may be initiated by massaging the abdomen, stroking the thigh, or having the patient lift himself slightly in the chair. Suprapubic compression may be applied to facilitate emptying. In the autonomous bladder where the sacral segment has been destroyed, such training is useless.

If a large residual persists, in the presence of satisfactory expulsive forces there must be either a mechanical or spastic obstruction at the bladder neck or in the urethra. If a urethrocystogram shows a shelf or ledge at the bladder neck and the prostatic urethra is otherwise easily distended, then the obstruction is due to a form of median bar and resection is indicated. Prior to resection, however, there should be satisfactory cystometrographic evidence of satisfactory reflex detrusor contractions if there is an upper motor neurone lesion, and if there is a lower motor neurone lesion the patient must be able to apply suprapubic pressure. It is not necessary to resect the entire circumference. The author uses the Gershom-Thompson cold punch, removing eight to ten strips (at 5 to 8 o'clock) from the bladder neck and extending to the highest point of the verumontanum.

It may be, however, that the urethrocystogram shows spasm of the external sphincter or of both sphincters, the whole length of the prostatic urethra being closed. This constitutes a spastic obstruction and is best treated by pudendal neurectomy, not nerve block. This procedure need not be limited to spasm of the external sphincter alone, but its use may be extended to spasms of both sphincters. The findings of striated muscle fibers in the region of the internal urinary meatus suggest that the motor impulses carried by the pudendal nerve reach the internal sphincter too.

In carrying out the operation, the patient is placed on his face and the table is angled at the pelvis. An incision is made starting at the border of the sacrum

and running obliquely downwards and outwards over the outer part of the ischiorectal fossa. The neurovascular bundle is found in Alcock's canal at a depth of 2 to 2.5 inches from the skin. The inferior hemorrhoidal nerve is usually found first and is a useful guide to the main nerve trunk. The greatest care is necessary to ensure division of the entire nerve.

Urethrocystograms a few days after operation will show wide opening of the prostatic urethra. Voiding occurs in a powerful stream and residual urine is largely eliminated. In 29 cases of pudendal neurectomy the average preoperative residual was 14 ounces. The postoperative average was 6 ounces. Ten cases were considered failures. In 6 of these, ultimate success was achieved by subsequent bladder neck resection or alcohol block.

The author presents diagrams to illustrate the nerve supply to the bladder and the types of neurogenic bladders discussed. There also are x-ray reproductions illustrating the bladder changes following resection and urethral widenings following pudendal neurectomy. —*Allan K. Swersie, M.D.*

Papillomatosis of the Urethra. A. ASHWORTH. *Brit. J. Urol.*, 1956, 28: 3.

INTEREST in this subject was stimulated by frequent findings of papillomas in the urethra during follow-up studies on bladder tumors. The author reviews 1,307 cases of bladder tumors with the object of noting the incidence of urethral papillomas and the associated characteristics.

Two types of urethral papilloma have been described by McCrea. The first type is a villous, transitional cell tumor resembling the vesical papilloma; the second is akin to the venereal warts found on the prepuce and glans penis. The present study deals with the first group. Among the 1,307 cases of bladder tumor there were 54 urethral tumors (4.1 per cent).

In analyzing the relationship to the type of bladder tumor, a greater incidence is noted in the case of papilliform growths. Thus, in 131 instances of multiple papillomatosis of the bladder there was an 8.4 per cent incidence of urethral tumor, in 420 benign papillomas an incidence of 6.9 per cent, and in 756 carcinomas, 1.8 per cent. In a breakdown in relation to sex, there were urethral papillomas in 50 males and 4 females. The greater incidence in males is believed to be due to the contraction of the external sphincter holding the urine in contact with the prostatic urethra for a longer period.

In 40 per cent of the cases the urethral growths were associated with the area of the internal meatus. In some cases masses about the circumference extended into the urethra as a continuous carpet of growth. In the male, the distribution favors the posterior urethra decidedly. In 50 cases there were 48 posterior and 7 anterior urethral growths. In the latter group, 5 also had posteriorly situated papillomas.

In the treatment of papillomas confined to the posterior urethra in both sexes, destruction by endoscopic fulguration, sometimes on repeated occasions, is employed. When the anterior urethra is involved there may be special problems; some may be suitable for repeated fulguration procedures. The author presents 4 cases of papillomas of the anterior urethra. In all of these there were multiple papillomas of the bladder which required many endoscopic procedures.

CASE 1. During a 2-year period of repeated fulgurations of papillary tumors in the bladder and posterior urethra, the growth spread to the anterior urethra. Endoscopic control was unsuccessful and it was evident that the tumors were out of control in the bladder also. A synchronous combined excision of the bladder and entire urethra was carried out with the object of removing the bladder and urethra en bloc in order to prevent the spill of tumor cells. Excision of the urethra was begun through an encircling incision of the meatus continued along the ventral penile surface. Over the bulbous area this was converted to an inverted V incision, and the urethra delivered. The bladder was mobilized through an abdominal approach. Next, the prostate and membranous urethra were freed by simultaneous dissection in the pelvis and perineum. The entire en bloc bladder-urethra specimen was lifted out through the abdominal incision. Photographs of the specimen, showing diffuse papillomatosis in the urethra are presented. The penis maintained its normal external appearance. No mention is made of disposition of the ureters.

CASE 2 deals with a diffuse papillomatosis of the entire urethra following a 4-year history of bladder tumor. Excision of the urethra was planned because endoscopic fulguration was not possible, but the patient died of visceral involvement.

CASES 3 and 4 are instances of papillomas in the bulbous urethra following bladder growths and, in one instance, involvement of the right kidney pelvis. The masses in the bulbous area were being controlled by fulguration.

Certain points come to light in reviewing the circumstances under which urethral tumors appear. In 74 per cent of the cases the internal meatus was involved by growth and in at least 5 of the 7 anterior urethral papillomas there was involvement of the posterior urethra. There is, therefore, an orderly centrifugal spread along the urethra from the internal meatus. The trauma incident to multiple endoscopic procedures affords ample opportunity for seeding to occur over the abraded mucosa. The theory of implantation fits into most of these cases, but occasionally the occurrence of urethral papillomas may represent a localized manifestation of some generalized "instability" of urinary tract epithelium. Whatever the mode of production, it would be a sensible precaution, after instrumentation of any patient with a strong tendency to form bladder papillomas, to wash out the urethra and bladder with a 1 to 5,000 solution of silver nitrate in order to destroy any sequestrated tumor cells.
—*Allan K. Swersie, M.D.*

GENITAL ORGANS

Cancer of the Prostate. Review and Personal Contribution Concerning the Present-Day Clinicodiagnostic and Therapeutic Orientation (Il cancro della prostata. Rassegna sintetica e contributo personale degli attuali orientamenti clinico-diagnostici e terapeutici). F. RENZO BANCHIERI and GIUSEPPE GAMBETTA. *Minerva med.*, Tor., 1956, 1: 487.

APPROXIMATELY 200 patients with prostatic cancer have been treated at the Istituti di Patologia Speciale

Chirurgica and in the Urologic Department of the Ospedale Cotolengo in Torino, Italy. Of these, 85 per cent received only treatment with a synthetic estrogen (stilbene). In the remaining 15 per cent an enucleation of the primarily enlarged prostatic adenoma with secondary malignant degeneration was combined with the estrogen. The authors' experience with other forms of medical treatment has been slight.

Treatment with the estrogenic preparation has consisted of initial doses of 150 to 200 milligrams per day (30–40 mgm. intravenously and the rest orally) for a period of 4 to 5 weeks. The maintenance dose has been 25 to 50 milligrams daily, with short intervals of rest if the patient complained of gastric and mammary disturbances. In patients with recurrences and in the so-called stilbene-resistant patients 200 to 250 grams are given for some weeks, the dose of the drug being decreased and even suspended temporarily when improvement is satisfactory. The signs of intolerance have been few. In accordance with the experience of other writers the authors have encountered the paradoxical fact that with massive doses the subjective disturbances have not become more pronounced.

From their experiences with these cases and a study of the literature, the authors conclude that the most essential factor in combating this progressively malignant and eventually fatal form of cancer is the earliest possible diagnosis. Early diagnosis is particularly important in prostatic cancer since the earlier the treatment is started, the more effective is the estrogenic therapy. In 95 per cent of the present series of patients a moderate increase in weight has been observed under estrogenic medication. The pain has tended to subside, with consequent improvement in the general condition. The dysuria has rapidly improved and the chronic retention of urine in the milder forms has tended to disappear or become notably smaller in amount.

With reference to the size and consistency of the tumor, the authors have noted that the carcinomatous nodules have tended to soften after an intense dosage regimen with the estrogen, and to disappear within a short time; indeed the improvement has been so rapid at times as to lead to some doubt concerning the correctness of the original diagnosis. When, however, the malignant process has broken through the prostatic capsule the estrogen treatment has not succeeded in producing a regression in the neoplastic foci.

Ultimate results have been optimum in 40 per cent of cases, and these patients have continued their ordinary avocations for more than 8 years. In 40 per cent the ultimate results of hormone therapy have been good and the general condition of the patients has remained satisfactory for 4 to 5 years. The ultimate results have been mediocre in 20 per cent, i.e., the patients have shown improvement for 1 to 2 years. Very few of these patients have failed to obtain improvement as to bone metastases and general physical well being from the medical treatment.

Hormone therapy might certainly be beneficially associated in some instances with cortisone therapy, with orchiectomy, and with irradiation of the prostate and of the hypophysis. —*John W. Brennan, M.D.*

A Review of the Causes of Death in Senile Benign Prostatic Enlargement; Survey of 810 Cases. P. Dawson-Edwards. *Brit. J. Urol.*, 1956, 28: 89.

A review of the causes of death in senile patients with benign prostatic enlargement, admitted to Queen Elizabeth Hospital, Birmingham, England, during the past 15 years, has been made. The era has been divided into the "pre-antibiotic period" (1939–1945) and the "antibiotic period" (1948–1953).

In the "pre-antibiotic period," in which sulfanilamide derivatives were the only urinary antiseptic agents, there were 643 admissions due to benign prostatic enlargement. Of this group, 87 patients died, giving an overall mortality of 14 per cent. Suprapubic drainage of the bladder was associated with the highest operative mortality—28 per cent, while of those 54 individuals who received no operative treatment at all, 33 per cent died. During the antibiotic period, 810 patients were admitted and only 37 of these patients died subsequently. The overall mortality was 4.6 per cent—a considerable reduction. In the group receiving suprapubic drainage of the bladder, the mortality rate fell to 6 per cent, and in those receiving no operative treatment it fell to 8 per cent.

Autopsy of the "pre-antibiotic period" deaths showed that 38 of the 64 patients had sepsis of the urinary tract, whereas in the later period only 5 of the 29 deaths were directly or indirectly related to urinary tract infection. The author attributes the marked drop in mortality in the later period to the use of antibiotics in the control of urinary infection.

(*Abstractor's note*) In addition to the antibiotic factor, the two series are hardly comparable since the retropubic prostatectomy and transurethral resection have in considerable degree replaced the perineal prostatectomy, and the one or two-stage suprapubic prostatectomy (Table I). Also, the knowledge of fluid and electrolyte balance has been put to practical use during the "antibiotic period" and advances in this field may well contribute to improved mortality statistics.

—*C. Barber Mueller, M.D.*

TABLE I.—COMPARISON OF MORTALITY FOR TREATMENT OF SIMPLE BENIGN PROSTATIC HYPERTROPHY FOR THE YEARS 1948–53 AND 1939–45

(Number of deaths indicated by figures in brackets.)

	Number	*Millin's retropubic prostatectomy*	*Suprapubic drainage*	*Perurethral resection*	*One-stage prostatectomy*	*Two-stage prostatectomy*	*Perineal prostatectomy*	*Suprapubic loop resection*	*No operative treatment*	*Actual operative mortality*
1948–53.....	810 (37)	317 (9)	67 (4)	249 (8)	15 (1)	49 (6)	21 (2)	7 (..)	85 (7)	—
Mortality (per cent)...	4.6	2.8	6	3.2	6.7	12	9.5	—	8.2	4.1
1939–45.....	643 (87)	4 (..)	106 (30)	137 (9)	104 (12)	158 (13)	45 (4)	15 (1)	54 (18)	—
Mortality (per cent)...	14	—	28	6.5	11.5	8	9	6.7	33.3	11.7

MISCELLANEOUS

Intestinocystoplasty; Report of 2 Cases. A. STEINBOCK. *Ann. chir. gyn. fenn.*, 1955, 44: 310.

THE AUTHOR deals with the problem of increasing the capacity of the sclerotic bladder by utilizing an isolated coil of intestine, either the cecum or ileum.

In tuberculosis, the inflammatory processes in the bladder may progress despite a unilateral nephrectomy with a remaining good kidney. The capacity is reduced and thus may lead to severe reflux into the ureter, which may take on some function as an additional bladder space. On the other hand, so-called "intramuritis" may cause a stenosis in the lower end of the ureter. In either event there is a tendency to ureterohydronephrosis and destruction of renal tissue, with gradual death of the healthy kidney.

There are procedures other than operations to enlarge bladder capacities which have been employed in these situations. Denervation of the bladder may relieve pain but does not protect the kidney. Nephrostomy is a definitive procedure, as is cutaneous ureterostomy usually, and does not have the advantages of intestinocystoplasty which does not create problems of external drainage. Nephrostomy can be used as a procedure to insure the result of intestinocystoplasty. In an emergency, cutaneous ureterostomy will save the patient's life. Ureteral implantation in tuberculous kidneys is considered dangerous.

In the diagnosis of bladder sclerosis, cystoscopy is unreliable. Urography inclusive of cystography will supply information regarding kidney function, ureteral status, and changes in the bladder such as double contours and irregularities. In typical cases the bladder is quite small and resembles a snake's head.

Either the cecum or ileum may be utilized in intestinocystoplasty. The majority of operators advocate the use of ileum. A bladder capacity of 400 to 500 cubic centimeters is desirable. If technically possible, a wide anastomosis is done. As performed by Cibert (with an experience of 17 cases of ileocystoplasty), the operation is for the most part extraperitoneal. The details of technique are not presented. In performing this operation, it is presupposed that the patient's kidney is fairly healthy, as is the ureter. If, however, there is severe stenosis in the lower end of the ureter, an anastomosis between the ureter and the bowel above the stenosis may conceivably be done at the same time. The author reports 2 cases:

In the first case the patient had tuberculous disease with clinical symptoms of 20 years' standing. One kidney had been removed. A tuberculous process was suspected in the upper part of the remaining kidney. The cystitis was very severe, with a bladder capacity of 30 cubic centimeters. Following cecocystoplasty the general condition improved considerably, and frequency was largely relieved. Within a few months, however, the patient died of sudden uremia brought on by an acute infection. It was thought that a cutaneous ureterostomy would have kept the patient alive longer.

In the second case, after removal of the right kidney for cavernous tuberculosis the patient continued to have severe cystitis progressing to advanced contraction of the bladder with dilatation of the ureter, and delayed renal function with dilatation of the calyces. An ileocystoplasty was performed. One month later urethrocystography showed a new bladder with adequate capacity and gross vesicoureteral reflux. Frequency and urgency were reduced and incontinence disappeared. However, it was too early to report the final result.

The article is accompanied by roentgenographic reproductions. —*Allan K. Swersie, M.D.*

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS

CONDITIONS OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

Giant Cell Tumors of Bone. Ernest M. Daland and Carlton R. Haines. *N. England. J. M.*, 1956, 254: 587.

Codman advised treating giant-cell bone tumors by subperiosteal resection of the tumor, collapsing any residual bony wall, and obliteration of the resulting cavity by infolding the periosteum. This essential procedure was done in 5 patients, one of whom had received previous radiation. Four patients have been followed 10 or more years and are now free of tumor, but 1 patient required two re-operations for recurrence. In 2 of these patients the lesion involved the lower end of the radius; both have a marked residual deformity but good function.

One large lesion in the femoral condyles was treated by curettage alone and another by curettage with bone grafting. One of these showed recurrence in the scar which was removed. Both patients are well 10 years later.

No chemical cauterization was used in these cases.

—*Charles T. Ryder, M.D.*

SURGERY OF THE BONES, JOINTS, MUSCLES, TENDONS, ETC.

The Treatment of Gaps in Long Bones by Cancellous Insert Grafts. E. A. Nicoll. *J. Bone Surg.*, 1956, 38-B: 70.

During the last 12 years, the author performed successful operations upon 27 long bone defects in which solid blocks of cancellous grafts combined with internal fixation were used with excellent results. In 6 of these a previous bone-grafting had resulted in failure. Failure occurred also in 3 other cases on two attempts. It is suggested that the radius, ulna, humerus, tibia, femur, and bones of the hands are excellent examples of bones in which long gaps can be bridged with iliac crest.

The author prefers blocks of the crest of the ilium in lieu of cortical bone because, theoretically, it has been postulated that osteogenesis is more rapid from the cut ends of the host bone. The bony architecture is vastly more amenable to osteoblastic impregnation, by virtue of a greater population of trabeculae and a concomitant increased rate of bony union. Bone blocks appear more desirable than chips or ribbonlike transplants. Absolute internal fixation is imperative to assure early bone union. The iliac crest is stable enough for rigid fixation and yet porous enough to achieve rapid osteogenesis.

The procedure briefly is that of placing the patient in the kidney position, exposing the crest of the ilium, reflecting the lateral ala of the ilium, and osteotomizing a block of bone 0.5 inch longer than the host defect.

Eburnated bones are excised, an inlay is inserted, and rigid internal (plate) fixation is executed. Seven cases in the present series are reported in detail. Union was obtained as early as 6 weeks and as late as 13 weeks.

The article is replete with 9 instructive colored plates depicting the technique and 29 roentgenograms,

—*Samuel L. Governale, M.D.*

The Possibilities in the Use of Metallic or of Acrylic Substances in Pseudarthrosis or Luxation Following Osteomyelitic Infections (Possibilités d'utilisation de pièces métalliques ou en acrylic pour pseudarthrose ou luxation après des infections ostéomyélitiques). Marcel Févre. *Rev. chir. orthop.*, Par., 1955, 41: 669.

The first case was that of a 6 year old girl with pseudarthrosis of the middle third of the right humerus, dating from 3 years previously. A Lafitte infibulating nail was introduced and the shaft of bone was reinforced by two bone grafts from the tibia, which were held in place by chromic catgut. Later a further bone graft from the tibia was added and held in place by metallic screws. The convalescence was uneventful and there was no recurrence of the original infection. Consolidation was complete.

The second case was that of an infant of 18 months who presented a healed osteomyelitis of the left hip joint, which had developed 17 months previously. An acrylic prosthesis replacing the head and neck of the femur was held in place by a metallic rod in a bore hole in the diaphysis. There was no reactivation of the infection, but the poorly adapted prosthesis cut through the bone and protruded under the skin. It was removed 3 months later without resulting infection. Ossification had progressed in the fibrous tissue and afforded considerable support to the articular apparatus, but a further attempt at introduction of an acrylic prosthesis would seem indicated.

The third case was that of a 4 year old girl with osteomyelitic destruction of the head and neck of the right femur. An acrylic prosthesis was introduced and later was reinforced with part of a rib from the bone bank. There was no reactivation of the infection, the prosthesis formed a new cotyloid for itself under the bone block, and the resulting movements of the joint are now limited, but permit the child to walk with ease. The osteomyelitis dated back to the first month of life.

The fourth case was that of a 4 year old boy with healed osteomyelitis of the right hip joint, dating back 16 months, with resorption of the femoral head. Despite the acrylic prosthesis the rigidity of the joint in flexion recurred. The limb was straightened by means of capsulotomy and lowering of the anterior superior spine of the ilium. Nine months later the child still limps markedly as a result of the shortening of the femur and the limited muscular action, but this disability should be susceptible to improvement. There was no reactivation of the condition.

The fifth case was that of a 20 year old youth with healed osteomyelitis of both hip joints (and other infectious lesions) dating back to his eleventh year of life. Both acrylic arthroplasties were carried out with-

out infectious reactivation, but the ankyloses of the two joints recurred. There was less marked rigidity of the right hip joint, apparently as a result of roentgen therapy. The prosthesis on the left side had to be removed later to treat the massive bony encirclement of the joint, and this resulted in a suppurative process (an infected hematoma in the cavity left after the previous operation). Improvement in this patient has not been notable. It is hoped that a second acrylic arthroplasty on the left side and the aid of roentgen therapy will yet produce considerable improvement.

From his experiences in this series of patients and his study of other reports (Jean Judet; Pierre Bertrand), the author concludes that where an osteomyelitis has remained healed for 16 to 18 months, reactivation of the infection following operation on the bone or joint lesion need not be anticipated in the young child. This precept would seem to hold whether acrylic or metallic prostheses are used.

For the healed osteomyelitis of older patients it would seem advisable to wait several years before attempting the operation of acrylic prosthesis arthroplasty. —*John W. Brennan, M.D.*

Treatment of Ununited Fracture of the Carpal Navicular by Styloidectomy of the Radius. Lyman Smith and Barry Friedman. *J. Bone Surg.*, 1956, 38-A: 368.

The authors call attention to the role of the radial styloid process in the production of fractures of the carpal navicular bone, and postulate that it is the impingement of this process on the fracture site which causes pain and disability in nonunion of the carpal navicular bone.

They report 13 cases with follow-up. In 10 of these the results were excellent. Many of these good results followed years of disability and marked localized bony changes as the result of long-standing nonunion.

The operative technique is described. The procedure has the advantage of simplicity, and a much shorter period of disability than other forms of treatment. —*Norman J. Rosenberg, M.D.*

Volkmann's Contracture; Treatment by Excision of the Infarct. H. J. Seddon. *J. Bone Surg.*, 1956, 38-B: 152.

The essential lesion in Volkmann's contracture is looked upon as a massive ischemic infarct. Treatment consists in excision of the irreparably damaged muscles and nerves making up the infarct. Preventive therapy is not discussed. These opinions are the result of thorough and detailed investigation of 6 patients with contracture, as well as 10 others similarly investigated as well as treated with certain degrees of success.

The infarction is ellipsoid in shape with the greatest damage in the center and the least in the periphery. Injury is greatest in the more deeply placed muscles. There are great variations in the changes, depending largely upon the level of the arterial lesion. The axis of the ellipsoid zone of ischemia is somewhere near the anterior interosseus artery. Damage to both muscle and nerve may be reversible, partially reversible, or irreversible. In a typically severe case the center of the infarct is dead tissue. The zone of necrosis is surrounded by one in which necrosis and fibrosis occur together. The fibrosis is less marked peripherally and the outermost zone shows reversible ischemia.

Excision of the infarct should be done only in the severe cases of Volkmann's contracture. It should also only be done after a prolonged period of conservative treatment and observation. This period should be at least 3 months and probably 6 months in duration. During this time treatment is limited to the use of a splint to minimize contracture; movements of all joints and daily galvanic stimulation if a nerve lesion is present.

The operation is done through a long longitudinal incision in the midline of the forearm in a bloodless field. All necrotic muscle is excised. If the muscles are pale and fibrotic and if they do not contract, or contract very feebly when stimulated, they are excised. The dissection continues best by following the median nerve along its course. Involved nerves, usually median and ulnar, are similarly excised.

Reconstructive procedures are necessary. If only deep flexor muscles are excised surgical reconstruction is unnecessary; otherwise transplantation of muscle and tendons must be done as best as possible in the individual case. Nerve loss is reconstructed by pedicle nerve grafts or often by free nerve grafts. Lastly, arthrodesis of the wrist may be necessary.

Results have varied but have been generally satisfactory. Correction of the contracture in operations done within 12 months from the injury have been almost complete. The treatment of patients is described, and the results are illustrated.

—*Donald C. Geist, M.D.*

The Treatment of Ruptured Tendons of the Hand and Wrist. Joseph L. Posch, Prentice J. Walker, and Harry Miller. *Am. J. Surg.*, 1956, 91: 669.

The incidence of ruptured tendons in the hand and the wrist is extremely low, and the rarity of these injuries frequently makes the diagnosis difficult. There are five general causes for the rupture of a tendon: (1) direct trauma, (2) indirect trauma, (3) spontaneous rupture after trauma, disease, or senility, (4) dislocation of tendons, and (5) herniation of muscle through its sheath.

Detachment of the extensor tendons at their insertion into the distal phalanx of the finger is the most frequent type of tendon rupture seen. Immediate operative repair of the injury is the treatment of choice, according to the authors. They approximate the torn dorsal aspect of the interphalangeal capsule and tendon with fine, nonabsorbable sutures of silk or cotton, with the finger held in hyperextension. If this primary treatment is unsuccessful, or if the patient is seen late, the author suggests the use of a tendon graft. A less frequent type of tendon rupture is that of the extensor tendon mechanism over the middle interphalangeal joint. Again, the authors believe that operative repair is the procedure of choice, and they suture the proximal portion of the central slip of the extensor tendon to the base of the middle phalanx with fine, nonabsorbable sutures. If the patient is seen late, or if the primary treatment has failed, a tendon graft is necessary to correct the deformity.

Dislocation of the extensor tendon over the metacarpophalangeal joints is rare. Usually it produces few

if any symptoms, and frequently it can be treated by splinting of the finger in extension. Occasionally, when the condition is older, operative treatment may be necessary. If so, it consists of making fascial bands over the heads of the metacarpal bones to control the excursion of the tendon.

Rupture of the extensor pollicis longus tendon has been described. It is of relatively frequent occurrence. Operative treatment seems to be the only method of restoration of function, since splinting and extension never have led to spontaneous repair. Occasionally, it may be possible to suture the ends of the tendon primarily, but usually approximation of the ends cannot be obtained, and a tendon graft is necessary.

Rupture of a flexor tendon is extremely rare. Only a few cases have been reported in the literature. The author's series included twelve cases. If the tendon rupture is seen early, surgical repair may well be successful, but when it is seen late, tendon grafting generally will be necessary, since there will be the apparent loss of substance resulting from the contracture of the muscle and the tendon. In all these repairs, the authors kept the part immobilized for 3 weeks and then instituted gentle rehabilitative exercises. The splint was used part-time thereafter.

The authors close their excellent article with a series of 6 cases to illustrate the points brought out in the text.

—E. W. Johnson, Jr., M.D.

Tendon Grafts for Flexor Tendon Injuries in the Fingers and Thumb; a Study of the Technique and Results. R. Guy Pulvertaft. *J. Bone Surg.*, 1956, 38-B: 175.

The results obtained in 149 patients subjected to flexor tendon grafting of the fingers and thumb are reviewed. The review covers the period of from 1942 to 1954. Three groups of tendons are considered: (1) the flexor digitorum profundus beyond the distal palmar crease; (2) the flexor digitorum profundus and sublimis in the same region; (3) the flexor pollicis longus beyond the wrist joint.

The action of the flexor tendons of the fingers is determined in two ways. The first method is that of measuring the distance by which the pulp of the finger tip fails to reach the distal crease of the palm. The second is that of estimating the range of active motion at the interphalangeal joint.

Operative care of the flexor digitorum profundus group was limited to those fingers with good passive motion and satisfactory sensation, or cases in which sensation could be restored by digital nerve suture. There were 28 patients, 6 of whom were not traced. Operative indications were less uniform in the flexor digitorum profundus and sublimis tendons. Of 109 fingers treated, 16 were untraced. Indications for grafting of the flexor pollicis longus tendons are less stringent. Moderate restriction of passive motion does not contraindicate operation. There were 37 patients, all of whom were traced.

The operative technique is presented in detail, and illustrated. Incisions vary with the tendon involved. Midlateral incisions suffice for the fingers; incisions in the palmar creases and various combined incisions are needed. Grafts have been taken from the palmaris longus and extensor digitorum longus to the fourth toe and the plantaris. Elongation of the flexor pollicis longus is used on occasion. Grafts may be removed through long incisions along the tendon course or through smaller limited incisions. Sufficient paratenon should be removed with the tendon.

In the present series, stainless steel wire was used for sutures. Bunnell end-to-end suture was used for the proximal suture and the distal one was accomplished by (1) suture to the remaining tag of tendon, (2) the use of Bunnell withdrawal sutures, or (3) by looping the tendon through a transverse hole in the terminal phalanx. The latter two methods were preferred. The tension under which the graft is placed should be a little greater than seems necessary at the time of operation. The thecal sheath is removed except for the digital vaginal ligaments which are used as new slings for the graft. If the vaginal ligaments are destroyed, new ones can be formed from short lengths of graft.

Return of active movement is slow. If it ceases to improve after 6 to 9 months, adhesions may have formed and improvement may be secured by tenolysis.

Results are shown in the form of graphs and by photographs illustrating function and motion. In the flexor profundus group, 50 per cent of the patients had motion of the finger tip to within one-half inch or less of the distal crease and in 14 per cent it reached the crease. Eighty-six per cent of the patients obtained 30 degrees of active flexion and 9 per cent attained 70 degrees. Extension was full in all except 4 patients. There were three failures. No complications occurred and no finger was made worse by the procedure.

In the flexor profundus and sublimis tendon group 70 per cent of the fingers could reach to within one inch of the distal crease but only 9 per cent regained perfect flexion. Flexion contracture at the proximal interphalangeal joint (of 30 degrees or more) occurred in 12 patients. Complete failure occurred in 9 cases. No complications developed.

There was a high degree of success in grafts in the flexor pollicis longus tendon. Eighty-five per cent attained 30 degrees of joint movement and 21 per cent reached 70 degrees. Only one failure occurred.

Little difference was noted in results as regards the choice of graft source. The influence of splinting and early movements was compared but no great difference was noted. Splinting with the thumb or finger in slight flexion was preferable. The most important factor in determining the end result was an exact and gentle surgical technique and complete hemostasis.

—Donald C. Geist, M.D.

Arthrodesis of the Osteoarthritic Hip Joint. Reginald Watson-Jones and Walter C. Robinson. *J. Bone Surg.*, 1956, 38-B: 353.

This degenerative change usually occurs in one hip joint only, without involvement of the other joints of the body. The present study is based on the results obtained with one standard type of arthrodesis in the hands of one surgeon who is responsible from beginning to end. One hundred and forty-one patients were treated for arthrodesis of the hip joint and the results were confirmed in 5 to 25 years from the date of operation. The authors believe that fixation of the osteoarthritic hip alone, by nailing, is of no value. Palliative measures such as massage, diathermy, injection of

lactic acid, and the use of cortisone preparations or irradiation are also considered of little value. A hot water bottle is just as effective as short wave diathermy. Simple measures such as the administration of salicylates are recommended.

The indications for intra-articular arthrodesis of the hip joint are as follows: (1) considerable pain in the hip, thigh, and knee; (2) movements restricted to about half the normal range or less; (3) restriction of walking; (4) unilateral arthritis; (5) free mobility of the knee joint on the side of the affected hip.

The technique for intra-articular arthrodesis of the hip joint is as follows: using the Smith-Petersen incision, the gluteal muscles are separated from the ilium; the limb is rotated outwards; every fragment of cartilage is removed from the acetabulum and from the femoral head; a guide wire is passed from the lateral aspect of the femur to the femoral neck which passes through the head of the femur. The hip is fused in a position of neutral rotation. Abduction is seldom maintained at more than 10 to 15 degrees; there must be no deliberate flexion of the limb; the guide wire is driven into the pelvis and the nail is punched over it. The final stage of the fusion is to impact the fragments of cancellous bone cut from the ilium and held in place by one screw. This procedure is carried out in one stage.

A double spica plaster cast is used for a minimum of 4 months. Following removal of the cast no physiotherapy is advocated. The complications encountered by the authors were: subtrochanteric fracture of the femur in 2 cases, foot drop in 2 cases, pulmonary infarct in 1 case, and thrombosis of the femoral vein in 1 case.

Of 141 patients, 3 died and 5 had wound infection; 12 had stiffness of the knee joint. Over 90 per cent of the 141 patients declared that they had no pain in the low back. Of 120 patients treated by intra-articular arthrodesis, nail fixation and bone grafts, there was failure in 7. —*Richard J. Bennett, Jr., M.D.*

Replacement of Gluteal Power by Rectus Abdominis in Flail Hip; Preliminary Communication with a Case-Report. A. K. Saha, Subir Kumar Chatterjee, and Binoy Chakarvarty. *Ind. J. Surg.*, 1956, 18: 31.

In the past many procedures have been suggested for the replacement of gluteal power in a paralyzed hip. As is known, a stable hip joint is essential to maintenance of erect posture, and paralysis of the musculature controlling the hip joint produces a characteristic deformity which is severely disabling. Extensor power to the hip has been restored by Ober with the use of a transplant of the sacrospinalis muscle mediated through a strip of the iliotibial band, and by Dickson by transposing the origin of the tensor fascia lata muscle backward. Lange and Kreuscher also have used the sacrospinalis muscle, and Lange has even suggested that the opposite latissimus dorsi be used to replace gluteal power to the hip. The standard operation is that first devised by Legg, who transplanted the insertion and the origin of the tensor fascia lata muscle backward. Wagner and Rizzo sought to gain abduction by transferring the origin of the sartorius, rectus femoris, and tensor fascia lata muscles backward. Finally, Mustard, in 1952, because of the inherent weakness of the above-mentioned muscles in their new function of restoration of gluteal power, reported a series of 12 cases in which the iliopsoas tendon had been transplanted into the greater trochanter with gratifying results.

The authors report a case in which the rectus abdominis muscle on the side of paralysis was transferred through a defect in the iliac crest and attached to the greater trochanter. The muscle was picked up from its sheath and was transferred, along with its blood supply and the ninth, tenth, and eleventh intercostal nerves. The patient was immobilized for 6 weeks in a plaster-of-paris spica cast, and 12 weeks after operation the authors were gratified to note active contractures in the transplanted rectus abdominis muscle.

They conclude by saying they are in no position to judge finally the result obtained from this type of procedure, but feel it has promise. They report the case as an early example, with the hopes of doing additional procedures of this kind in the future.

—*E. W. Johnson, Jr., M.D.*

Treatment of Lesions of the Semilunar Cartilages. Bent Barfod and Franz Bierring. *Acta chir. scand.*, 1956, 110: 422.

Since lesions of the semilunar cartilages are incurred chiefly by young and able-bodied persons, the choice of treatment naturally involves financial considerations of some import. Some surgeons prefer surgical treatment; others prefer conservative treatment. The authors review the records of 137 patients seen in the Roskilde Amts og Bys Sygehus at Roskilde, Denmark, with two objectives: (1) to find out how soon the patients became fit for work again, and (2) to trace factors of importance in the occurrence of poor results in the treatment of lesions of the semilunar cartilages. In the series of 137 patients, a total of 140 knee joints were treated; 112 patients underwent meniscectomy and 28 were treated conservatively.

The age groups most often affected were those of the second, third, and fourth decades; the greatest incidence was noted in the decade of 21 to 30 years, in men. Both knees were affected equally, and among men operated upon the medial meniscus was injured in 74 and the lateral in 14, a ratio of 5 to 1. However, among women operated upon there were 16 medial and 8 lateral meniscus lesions, a ratio of 2 to 1. In 13 of the 109 men in this series there was no history of trauma, and a similar situation existed in 7 of 31 women in this group. Nontraumatic disorders of the semilunar cartilages were far more frequent in patients more than 50 years old. Attacks of locking and inability to extend the knee completely occurred in 84 per cent of the patients in this series, and at operation longitudinal splitting and transverse rupture of the meniscus were found in 63 cases, in 21 of which no dislocation of the cartilage existed. Separation of the cartilage from the capsule was found in 49 cases, including 22 in which there was no dislocation. These last 22 cases, comprising 20 per cent of the series, represent the greatest number in which cure by immobilization alone theoretically could be achieved.

The condition of 134 patients in this series was followed personally by the authors. The follow-up examination consisted of the taking of the history and performance of clinical examination. On this basis they

rated their results as (1) good, (2) distinctly improved, and (3) poor. Special attention was attached to the patient's capacity for work, and all patients whose condition was in groups 1 and 2 were considered to be able to continue their previous occupation. Those who had obtained poor results derived no benefit from the operation. The condition of 95 per cent of the men operated upon was that of group 1 or 2; in other words, the result was either good or distinctly improved, while the condition of 94 per cent of the women operated upon was that of group 1 or 2. The incidence of poor results was greatest among women; and the authors feel this is due to the greater tendency toward arthrosis in women.

The authors write that the frequency of attacks of locking and of hydrarthrosis was of no significance in respect to the results. There also seemed to be no definite relationship between age and the ultimate result, and it is stressed that the operative results were no poorer among the elderly patients than among younger individuals. It was striking, too, that the poorest results in women were noted among those operated upon in the age group of 31 to 40 years.

In the matter of late complications of the operation, the authors conclude that among patients more than 35 to 40 years old, arthrosis is likely to develop in the injured knee if the symptoms have been present longer than 6 months. Moreover, the presence of arthrosis at operation suggests the worst prognosis. The authors conclude that patients who have arthrosis in the knee should be operated upon at an earlier date.

In follow-up studies arthrosis was found in 22 of 86 men, or 26 per cent; and in 58 per cent of the women. The authors noted that the frequency of arthrosis, as characterized by coarse grinding in the knee on movement, was the same in all age groups. They conclude that the frequency of osteoarthritis or arthrosis deformans is independent of the duration of the period of observation, and they write that trauma in predisposed persons of both sexes seems to accelerate the development of osteoarthritis, which otherwise would have appeared at a later age.

Studies of the seven patients who obtained poor results indicated that the lesion of the semilunar cartilage probably was responsible for the poor result in 4 cases. Two patients achieved poor results because of irrelevant factors.

Studies of disability showed that 68 per cent of the patients were fully fit for work within 6 weeks, while 88 per cent of the entire series were able to return to work within 3 months. Eighty-one per cent of the younger patients were fit for work within 6 weeks, while 91 per cent were able to return to work within 3 months. The foregoing demonstrates that patients of more advanced age resume work later than do younger patients.

In the matter of diagnosis, during the 18 years covered by this series 27 arthrotomies were performed on knees judged to have a lesion of the semilunar cartilage, but in which no lesion was found. Furthermore, another 139 knees were operated upon and in 81 per cent of these the diagnosis was verified at the time of operation. Preoperative arthrography was performed in some cases, but was not diagnostically helpful and sometimes was misleading.

The authors conclude that early operation is recommended because of the shorter treatment period and the better results in lesions of the semilunar cartilage.

—E. W. Johnson, Jr., M.D.

FRACTURES AND DISLOCATIONS

The Influence of the Proteinemic Picture in the Evolution of Bone Fractures (L'influenza del quadro protidemico nella evoluzione delle fratture). ANDREA CARTA. *Rass. ital. chir. med.*, 1955, 4: 623.

THIRTY CASES of fractures in patients 20 to 55 years of age, and of both sexes, were studied to determine the progress of healing of their fractures in relation to their proteinemic titers. All patients were given a diet capable of producing 24 calories per kilograms daily. This diet was composed of 90 grams of protein with a caloric value of 380, the remainder of the nutriment being provided by carbohydrates and fats.

In addition to the diet described, 10 of these patients received orally or parenterically, a mixture of aminoacids (methionine, glycine, histidine, and glutamic acid). In this last group, 21 to 55 years of age, there was only one instance of delayed consolidation of the fracture. In this patient, 49 years of age, the proteinemic titer was consistently below 7.00 per cent (colormetric titration by the method of Wu and Ling).

In the remaining 20 cases there were 5 instances of delayed consolidation; in all these the protein readings were consistently low (below 7.00 per cent); in all the others the readings were consistently high (above 7.00 per cent).

Another finding which appeared in this latter group was a tendency for the lower protein titers to occur in the older patients. One of these patients with delayed healing and low protein titer was young (22 years); the others were all over 50 years of age, and the author wonders if this tendency to delayed bone healing, and to lower plasma protein readings could be a sign of senescence, a senescence without other clinical evidence of its presence. Certainly the younger patients in the group did not manifest this tendency; indeed, the younger individuals manifested, on the whole, a protein genetic activity which was decidedly above the average.

The author believes that the demonstration in the plasma of patients with fracture of such decided modifications in the protein concentration, either as a surplus or as a deficiency, and with such a consistent corollary relationship to the process of bone healing, assumes significance in the matter of callus formation. He thinks that the titer of plasma proteins may also be important with reference to the indications for surgical interference in cases of fracture.

—John W. Brennan, M.D.

Massive Sliding Inlay Bone Graft for the Correction of Ununited Fractures of Long Bones. J. HUBER WAGNER and FRANCIS P. FERRARIO. *Am. J. Surg.*, 1956, 91: 486.

NINE TYPES of bone-grafting procedures have been utilized in the past in an attempt to correct ununited fractures. These are: (1) single-onlay cortical graft, (2) double-onlay cortical graft, (3) inlay graft, (4) peg graft, (5) intramedullary graft, (6) osteoperiosteal

graft, (7) multiple-chip graft, (8) whole-bone transplant graft, and (9) massive sliding-inlay bone graft.

The authors discuss the technique and advantages of the last named type of graft, namely, massive sliding inlay bone graft. The technique is to expose widely the site of the ununited fracture so that normal bone can be visualized above and below the site of this fracture. The fibrous and bony tissue between the ends of the bone, as well as that material obstructing the medullary canal, is exposed thoroughly. Care is taken to open completely the medullary canal above and below the area of nonunion. The bone fragments are aligned and the grafts are cut in situ with an electric saw, after which they are removed, reversed, and placed in such a position that the larger graft fits into the mortise distally, traverses the fracture line, and extends far enough above the fracture line to ensure good bridging and fixation. The smaller graft that remains is used to fill the defect. The authors do not use internal fixation routinely, but feel that if adequate fixation is afforded by the graft, the fracture will be stable enough without fixation.

In the opinion of the authors, this procedure offers several important advantages. First, there is no need for a bone bank, and by the use of bone from the same general area, the authors believe they are not only supplying an autogenous graft, but are using bone which has the same texture and composition and is from the same environment, as the host bone, so to speak. Second, this procedure allows for the placing of larger bone grafts across the site of fracture than do other types of procedures, and these grafts serve as a matrix for osteogenesis. Third, the procedure is of value because, by its very nature, it opens the medullary cavity, a fact which to the authors is of utmost importance in achieving primary union postoperatively. Fourth, the shape and contour of the bone which is obtained as an end result very closely resembles that which would have occurred had a simple fracture been treated by simple manipulation without surgery. The authors note that the bone heals after such bone grafting with no bulbous or excess formation of callus at the site of fracture and thus, minimal cosmetic deformity ensues.

The authors stress some basic principles which they believe should be observed to secure good results. These basic principles are: first, the presence of osteoporosis when the patient is first seen militates against satisfactory results. The authors feel that this osteoporosis is due to disuse, and that it should be reversed by active use of the extremity, paravertebral blocks, and physiotherapy in an attempt to remineralize the bone prior to surgery. The authors suggest it is wise to wait 2 or 3 months, if necessary, to obtain early remineralization of the bone before bone-graft surgery is attempted. Second, infection following compound fractures can militate against satisfactory results, and should be cleared up prior to operation. Third, the authors stress complete freeing of the area of ununited fracture of all its adherent fibrous and bony tissue, and opening widely the intramedullary canal above and below the area of nonunion.

The authors report on 182 patients who underwent 196 bone-grafting procedures by this method. Primary bony union resulted postoperatively in 169. Thirteen patients required more than one operation, and the largest group of such reoperations was of 4 cases involving the tibia. The next largest group of reoperations involved the radius and ulna, the number being four.

The authors present 8 cases in brief. They use roentgenograms to illustrate the points in their text. In commenting on these cases they again reiterate their feeling that autogenous bone is better than heterogenous or even homogenous bone for grafting purposes, that opening of the intramedullary cavity widely is of major importance, and that the massive inlay bone grafts heal by blending into the major bone fragments above and below the traversed site of fracture.

There is a brief discussion of the complications which can arise as a consequence of this procedure; fracture of the donor site, infection, and failure of union are the most frequent complications. These they will discuss in a later paper. —*E. W. Johnson, Jr., M.D.*

Fractures of the Triquetrum. Noel F. Bartone and R. Vincent Grieco. *J. Bone Surg.*, 1956, 38-A: 353.

The present study is based on 46 cases of fracture of the triquetrum. The authors point out that this is the second most frequent carpal fracture, but that it occurs only about once in every thirteen carpal navicular fractures. In the authors' series, the majority of fractures occurred as a result of falls on the hand with the wrist in forced palmar flexion or violent dorsiflexion, direct blows to the dorsum of the wrist, or some resistance against twisting motions of the wrist.

The types of the fractures occurring in the triquetrum are described, and the importance of multiple roentgenographic views is emphasized.

—*Norman J. Rosenberg, M.D.*

Fracture of the Odontoid Process; Report of 63 Cases. Edwin W. Amyes and Frank M. Anderson. *Arch. Surg.*, 1956, 72: 377.

The authors report 63 cases of fracture of the odontoid seen since January 1939. Death occurred in only 5 patients, or 8 per cent. This mortality rate is much lower than any previous report had indicated and the authors believe it is due less to specific treatment than to the fact that this diagnosis is now made more frequently in the less severely injured case.

The chief complaint is usually a painful stiff neck following a head and neck injury. In this type of patient, the authors advise hospitalization and observation over a period of several days. There is usually marked nuchal rigidity, and most patients object to any motion of the head. The diagnosis is confirmed by x-ray studies; in some cases it is necessary to make planigrams. Of the 58 patients who survived, 5 had sufficient compression of the spinal cord to cause weakness of the extremities.

Most of the patients were treated with bed rest for a period of a month or more after injury, and immobilization was maintained by skeletal traction, cast, or collar. Traction, either halter or Crutchfield tongs, was used in the treatment of all but a very few patients. The authors point out the complications that are apt to accompany the use of the Crutchfield tongs. The rate of healing varied between 4 to 9 months and at times it was difficult to demonstrate the exact end point.

Of the 5 deaths, only 2 were produced by compression of the spinal cord. —*Edgar L. Ralston, M.D.*

A New Method of Extension Treatment in Bennett's Fracture. LARS THOREN. *Acta chir. scand.*, 1956, 110: 485.

THE ACTIVE METHODS of treatment in Bennett's fracture are the following:

1. Reduction and fixation with a splint or with plaster of paris in a position of abduction as described by Bennett in 1882.

2. Reduction, extension, and fixation with plaster of paris by the Bohler method (described by Ehalt in 1929) with several modifications.

3. Reduction and fixation of the first metacarpal bone to the second metacarpal bone or to the trapezium with a plaster of paris cast, as described by Johnson in 1944, Ellis in 1946, Wagner in 1950, and Wiggins *et al.* in 1954.

4. Open reduction and osteosynthesis described by Fasko in 1947, Bunnell in 1948, Moberg in 1952, and Gedda in 1954.

Simple reduction and fixation in a position of abduction sometimes suffice, but redislocation is apt to occur. The author's method is that based on fixation by traction applied obliquely through the base of the first metacarpal bone, combined with open or closed reduction. This method was used for the first time by Hulten in 1944. It has been used particularly in difficult cases. Traction by a wire, intended to counteract the displacement, is applied to the long axis of the base of the first metacarpal bone and at the same time force is applied to the base of the metacarpal bone in an ulnar and somewhat volar direction. The traction force then has the ideal effect. Figures 1 and 2 show the method of reduction and maintenance of the reduction of this Bennett's fracture. Early movement of the fingers is encouraged. The traction is maintained for 4 or 5 weeks.

In this series there were 10 fractures in 9 patients who were operated on, with perfect anatomical reduction in 8. Excellent function was restored in 7.

—*Daniel H. Levinthal, M.D.*

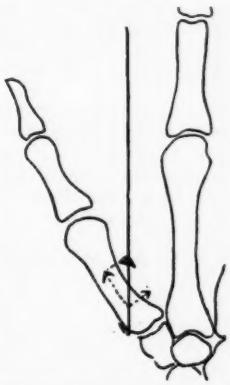

FIG. 1 (Thoren). Traction is applied obliquely through the base of the first metacarpal bone.

The Cutaneous Problem in Open Fractures of the Leg and Their Complications (Le problème cutané dans les fractures ouvertes de jambe et leurs complications). L. P. CASTEL, J. P. LINTILHAC, and A. RÉSILLOT. *Rev. chir. orthop.*, Par., 1955, 41: 707.

NINE INSTANCES of tibial fracture of a severe character with exposure of the fracture site are briefly reported from Casablanca, Morocco, Africa. This study has received the Prix Dubreuil of the Académie of Chirurgie for 1954. The authors have published their findings in order to show the markedly rapid and complete consolidation of the break, once a complete skin covering has been secured over the fracture area by means of skin grafting.

The first patient was a 30 year old native with an open fracture of the tibia at the junction of the middle and inferior thirds of the right leg. The exposed surface was 8 centimeters in the vertical axis and 3 centimeters in width. After the usual thorough preparation of the wound the gap was covered with a contiguous bipedicled graft from the anterointernal surface of the

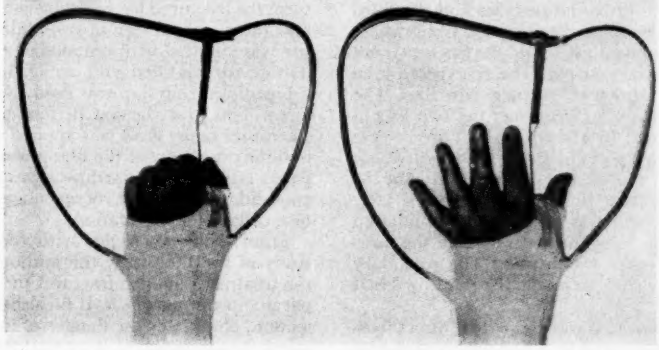

FIG. 2 (Thoren). Exercise of the finger joints and the two distal joints of the thumb is possible. The racket splint can, of course, be made smaller.

leg. Four months later the bone was completely consolidated, and the patient was able to walk home from the hospital. There were no complications and the fracture healed as a closed break at this level would normally heal.

The second patient was a 25 year old native with an open fracture of the left leg at the junction of the upper and middle thirds. The fracture was comminuted and the wound, 5 centimeters in length, was on the inner surface of the leg. Again with the aid of a bipedicled contiguous skin flap consolidation took place within 4 months' time (a period similar to that required for the healing of a closed fracture of similar nature.

The third patient was a 30 year old native with an open fracture at the junction of the middle and lower thirds of the right tibia. The wound was covered by a flap of skin and subcutaneous tissue with a single distal pedicle. Despite the unfavorable location of the pedicle the flap healed without complications and the fracture was consolidated in less than 4 months.

The fourth patient was a 35 year old native. The bipedicled sliding skin graft was applied 8 days after occurrence of the injury. Healing of the flap was uncomplicated and the patient was discharged from the hospital 3 weeks later in excellent condition with the leg in a cast.

The fifth patient was a 35 year old Berber with an open comminuted fracture of the right leg, who came from a distance of 300 kilometers after receiving emergency treatment of the wound. The edges of bone were gouged away until bleeding bone was reached, and the wound was covered by a bipedicled skin graft. There was no suppuration, and healing of the graft followed without complication. Four months later the patient left the hospital with the leg in a plaster boot and the fracture well on the way to consolidation.

The sixth patient was a 45 year old native with extensive injuries of both legs. Trauma to the right leg was so severe that amputation was deemed advisable. There was a large wound on the medial surface of the right knee which did not involve the joint cavity. There was also a large wound on the medial aspect of the right ankle with fracture of the medial condyle. Intramedullary fixation of the right tibia was carried out and the wound involving the greater portion of the anterior surface of the tibia was covered with three skin flaps—two with proximal pedicles and the third with a distal pedicle. These flaps healed per primam except for the area immediately over the fracture; here sloughing of the graft occurred. The re-exposed area was covered later with a crossed-leg skin flap. The transfer was practically a direct one; the two legs in contact were enclosed in a single cast. Three weeks later the pedicle of the crossed-leg skin flap was divided; healing of the graft was perfect. Consolidation of the fracture then progressed rapidly. Five months later the intramedullary nail was removed; consolidation was complete. Aside from some sequelae of the associated injuries the result was perfect. The secondary wound was as easily covered as the site of the original injury.

The seventh patient also was treated by direct fixation and the wound covered by a flap with a proximal pedicle. However, the size of the flap had not been correctly estimated and under tension became cyanotic and eventually sloughed. Eleven days after the original injury the fracture site was opened and all scar tissue cut away. There was no sign of suppuration. The wound was then covered by a crossed-leg skin flap. With the exception of the lowermost portion this flap healed. A Wassermann reaction at this time proved positive. After the pedicle of this last graft was divided an osteitis of the two bone ends was discovered. The intramedullary nail was exposed for a distance of about 3 centimeters. The nail was removed, the infected bone ends were gouged away, and the whole area was again covered with the freed flap. The consolidation of the bone was delayed but was finally complete.

The eighth patient was a 35 year old native whose wound over the fractured tibia had been sutured at the emergency station. The sutures did not hold; the bone became exposed and began to show areas of necrosis. The necrotic bone was removed and a bipedicled skin flap applied. Three months later consolidation of the fracture was progressing and the patient left the hospital.

The ninth patient was a 60 year old native with an open fracture of the right tibia at the junction between the middle and distal thirds. Primary suture was performed, but again the sutures did not hold and an osteitis developed. The resulting suppuration was so severe that amputation was proposed and refused. Four months later there was still no evidence of consolidation. The necrotic bone was curetted out and a skin flap was prepared. First the lateral incisions were made and the flap was raised. The superior pedicle was then divided in two stages. During the preparation of the flap the general condition of the patient was improved (plasma perfusions), and a syphilitic infection was treated with penicillin and bismuth. Two months after beginning preparation of the flap it was shifted, and after another delay the distal pedicle was cut. The lower portion of the graft did not take and was grafted again. During this period, despite the suppuration, the fracture became consolidated. Eight months after the injury the patient left the hospital, and walked with the aid of a cane.

Finally, brief mention is made of a case of pseudarthrosis which has already been reported. At the time of examination a fistula was present at the site of fracture; the fractured leg was shortened by 4 centimeters, and there was no sign of consolidation. The fracture site was curetted with removal of a small sequestrum. The cavity was filled with pedicled muscle flaps. Later a bipedicled skin flap was used to cover the raw surfaces. This graft healed perfectly. A month later a Phemister onlay graft was applied to the tibia and an oblique osteotomy of the fibula was performed. A few weeks later the pseudarthrosis was well on the way to consolidation and the roentgenogram showed a definite callus of consolidation.

From their experience with these patients and a study of the literature, the authors conclude that in the treatment of open fractures the skin covering is of paramount importance. It furnishes a cutaneous protection, eliminates the danger of infection, and minimizes the formation of cicatricial tissue. The skin itself is the best possible dressing for the healing bone.

—John W. Brennan, M.D.

The Physiopathology and Treatment of Fractures of the Shaft of the Tibia (Fisiopatologia y tratamiento de las fracturas diafisarias de tibia). ELOY R. VALDÉS SANTURIO, V. VALLIÑA GARCIA, and V. ALVAREZ ORTIZ. *Acta ortop. traumat. Iberica*, 1956, 4: 1.

THE PRESENT symposium consists of a careful, critical review of the literature on fractures of the tibial shaft, and a report of the treatment and results in 323 cases observed in several Spanish hospitals.

Some of the points emphasized by these authors are: (1) restoration of alignment is of greatest importance, while some shortening may be accepted; (2) treatment should commence as early as possible in both open and closed fractures; (3) open reduction may permit accurate and stable reduction that is otherwise unobtainable, and may accelerate convalescence; (4) extensive callus formation indicates incomplete immobilization; (5) in the management of open fractures a number of factors must be considered, i.e., the elapse of time since injury, environment of the injury, adequacy of treatment facilities, etc.; (6) in peace time many open fractures can be closed primarily.

For case analyses, the authors have divided their material into three groups: (1) closed fractures in children (40 cases); (2) closed fractures in adults (223 cases); (3) open fractures (60 cases). Each group is subdivided according to the type of fracture—spiral, oblique, transverse, and comminuted.

In the great majority of cases treatment consisted of closed reduction and plaster immobilization, or, in open fractures, débridement, reduction, and plaster fixation. The other methods of fixation, all associated with open reduction, included the use of encircling wire ligatures, parallel transfixion screws, intramedullary rod, and a combination or ligatures and screw. In all of the cases a supplementary plaster support was applied. Very few cases were managed by continuous traction.

The analysis considers the time of immobilization, the time of functional recovery, the anatomic and functional results (graded fairly strictly as excellent, good, and mediocre), and the complications. Unfortunately the number of cases treated by the several open methods in each subgroup is often so small that the significance of the figures is questionable; however, when the largest and most homogeneous group—closed fractures in adults—is taken as a whole, a superiority of the open methods in this series seems definite, as indicated in the accompanying table. The "anatomic index" and "functional index" are based on 100 for excellent, 75 for good, and 50 for mediocre.

	Intramedullary rod	*Wire ligature*	*Transfixion screws*	*Plaster only*
Number of cases	15	6	22	173
Mean immobilization time (weeks)	16	16	15	20
Mean functional recovery (weeks)	19	20	18	26
Anatomic index	88	96	99	82
Functional index	98	100	97	94

A similar table for closed fractures in children shows little real difference among the cases treated by open and closed methods. On the other hand, the figures for the 60 open fractures indicate better results in those 49 cases managed without internal fixation.

—Charles T. Ryder, M.D.

ORTHOPEDICS IN GENERAL

The Effect of Anticoagulant Therapy on Bone Repair. FRANK E. STINCHFIELD, BALU SANKARAN, and ROBERT SAMILSON. *J. Bone Surg.*, 1956, 38-A: 270.

THE STIMULUS for this animal research was the development of pseudarthroses in 4 patients following spinal fusions. All of these patients had received anticoagulant therapy for thrombophlebitis shortly after the fusion operations.

Twenty-six control and 26 experimental animals were employed. A plug of ilium was removed with a Stryker saw and then replaced after being freed of all soft tissue attachments. Heparin dosage was arranged to maintain the venous clotting time at a level above 25 minutes. In the animals given dicumarol, the prothrombin time was maintained at 30 to 35 seconds.

The rabbits were then sacrificed at 3 weeks and the dogs at 4 weeks. Bone bridging occurred in all the control animals. Delayed healing of bone was observed in all animals given anticoagulants. The greatest changes were seen when both heparin and dicumarol were given on the first postoperative day and continued for 3 weeks. Here there was considerable resorption of the graft. The changes were almost as demonstrative when the drugs were started 1 week postoperatively and continued for 2 weeks. Even when the anticoagulant therapy was given for 1 week preoperatively bone healing was delayed in contrast to the control animals.

The theories offered as to the cause for this delayed bone repair are: (1) lack of fibrin clot; (2) lack of adequate local calcium due to an increased calcium requirement for blood clotting as the prothrombin decreases; and (3) that heparin may replace chondroitin-sulphuric acid since both are mucopolysaccharides. Anticoagulants definitely produce delayed bone healing in animals. Whether or not these changes occur also in the human is not yet known.

—D. Keith McElroy, M.D.

Retardation of Growth After Traumatic Epiphysial Separation. GUNNAR REDELL. *Acta orthop. scand.*, 1955, 25: 97.

THE AUTHOR has reviewed the literature on traumatic epiphysial separation, and only rarely did he note mention of disturbance of growth as a consequence of epiphysial separation. Recently, however, he has had the opportunity to treat 2 patients having functional disorder and deformity after epiphysial separation of the distal end of the radius. He reports the 2 cases in considerable detail to illustrate the point that functional loss in the epiphysis may develop as a late change subsequent to injury. Both of these patients presented serious and difficult surgical problems. It is the author's wish that any readers who may have plausible suggestions for the alleviation of such conditions inform him of such suggestions.

—E. W. Johnson, Jr., M.D.

A Case of Fat Embolism; Concomitant Contribution with Reference to an Indication of Intramedullary Metal Fixation of Fractures of the Femur (Ein Fall zentraler Fettembolie). R. STRELI. *Klin. Med.*, Wien., 1956, 11: 76.

A 30 YEAR OLD FARM WORKER sustained a compound fracture of one femur and a simple fracture of the contralateral side in an accident. Intramedullary nails were inserted. On the fourth postoperative day the patient showed signs of cerebral irritation and stupor. On the sixth postoperative day the temperature rose to 39 degrees C and there was complete anuria. The patient expired on the eighth postoperative day.

The autopsy revealed multiple hemorrhages in the cerebrum and cerebellum. The lungs appeared to be of normal appearance except for a moderate amount of edema. Histologically, typical fat emboli were found in the brain and in the capillaries. These changes were found on the surface of the cerebrum as well as in the medulla oblongata. Fat emboli were also found in the kidneys, particularly in the glomeruli. Small numbers of fat emboli were found in the lungs. The author presents 3 additional cases of fat embolism, with fatal termination in all 4 cases.

Inasmuch as in a third of all cases that are brought to autopsy a patent foramen ovale is found, this anomaly should be taken into consideration in every case of fat embolism. Intramedullary nailing is contraindicated in cases in which two long bones are fractured.

—George I. Reiss, M.D.

The Importance of Biomechanical Factors in Bone Healing (Die Bedeutung biomechanischer Faktoren bei der Knochenheilung). S. OREL. *Helvet. chir. acta.*, 1956, 23: 1.

IN BONE there is a constant interplay between new formation and destruction of tissue. This process is accelerated by a fracture. In a transplanted bone new bone is formed, predominately by hyperplasia of the endosteal connective tissue, concurrently with the destruction of the transplant. New bone formation occurs most rapidly when a defect has been created by trauma, that is, by fracture or operation. The endosteal and periosteal cells grow into the fibrin network of the hematoma. The proliferating tissue is rich in new blood vessels which have their origin in the periosteum and soft tissues of the region.

One often sees callus formation and firm union when conditions appear unfavorable. The deciding factor is the nutrition supplied by the surrounding connective tissue. A fracture of compact bone in an area which is poor in connective tissue will heal slowly.

In fractures which are difficult to heal, stimulation of new bone formation by subperiosteal implantation of various materials has been attempted. These include fresh bone, boiled bone, bone meal, and bank bone. Even if new bone does form, union does not always occur. The newly formed bone and the graft do not have the power to prevent motion. The newly formed trabeculae do not have time to become calcified and bridge the fracture. As the trabeculae are disturbed and even broken the periosteal cells proliferate into the space. Their blood supply is not as easily damaged as is the supply to the endosteal cells. The periosteal cells then produce the tissue of pseudarthrosis. It follows that firm union is to be expected even in difficult cases if microscopic motion of the fracture site is prevented.

In fractures of the clavicle, for example, some displacement and motion are unavoidable. The roentgenogram shows an exuberant callus. If it were possible originally to reduce and fix the fragments accurately such a callus would not be produced. It is to be emphasized that the formation of a massive callus does not guarantee firm union. In compression fractures the contact and fixation of the fragments is good and little callus is seen.

In an effort to produce the ideal conditions for union we try to produce a situation similar to a compression fracture. That is to convert the fracture to a fissure. Then the necrotic and damaged trabeculae are absorbed and osteoid tissue arranges itself along a connective tissue framework. If motion of the fissure is prevented a quick consolidation and early union will result. The blood flow in the region of the fracture will be promoted if the neighboring joints remain free and the musculature retains some activity.

Formerly these conditions were difficult to achieve. With the advent of Küntscher nailing and methods of screwing fractures a satisfactory fixation of the fracture became possible. However, pressure of the metal frequently led to bone necrosis and some motion became possible. Hoffman sought to eliminate this difficulty by placing parallel screws in the fragments and connecting them with a rod. With this apparatus the pressure on the fracture could be regulated during the entire duration of treatment. The author had considerable doubt about the method when it was first presented in 1952. He has, however, used it in cases in which other fixation methods were insufficient.

In a case of diaphyseal fracture of the humerus treated with an intramedullary nail the nail tract became infected. The nail was removed and pseudarthrosis developed. Twenty months later open reduction and fixation with the Hoffman apparatus was performed. The patient returned to work in 6 weeks. Joint motion improved. Firm union with shortening of the arm was the result.

Three cases of nonunion of the tibia healed when treated with open reduction and fixation with the Hoffman apparatus. In one case ontogenous spongy bone was used as a graft.

Healing in a callus occurs in three phases: (1) the formation of new bone, (2) the clinical consolidation, and (3) the roentgenological manifestation of calcification. Consolidation is not at first apparent in the roentgenogram and is a clinical impression.

The cases which are described demonstrate that the Hoffman apparatus provides satisfactory reduction, fixation, and compression. It may provide 5 to 8.5 months of fixation. The screws do not loosen and their tracts do not usually become infected; antibiotics may be used if this occurs. Injury to the major vessels and nerves does not occur if the introduction of the screws is carefully planned.

The author believes that the method should be reserved for especially difficult cases, such as pseudarthrosis, and cases in which the joints should not be immobilized. According to Hoffman the method is suitable for closed fractures which are very difficult to

reduce and in which reduction is difficult to maintain, fractures which otherwise require operative intervention, open fractures, and multiple fractures. The clinical impression of consolidation is easily obtained when the Hoffman apparatus is used. The connecting rod is merely unlocked and one can test the rigidity of the fracture.

Reduction, fixation contact, compression of the fragments, nutrition, and time are the factors which play a role in bone healing. The first four of these factors are present when the Hoffman apparatus is used. The neighboring joints remain free and the motion stimulates the consolidation of the callus. Displacement is less likely because the bone ends are pressed firmly together. The narrow gap between the fragments requires a minimum of tissue. Consequently the body has to contribute less to the healing area. However, these considerations hold true only for noncomminuted fractures in compact bone. In comminuted fractures the fragments should not be compressed.

The nutrition of the callus is an important factor. The blood supply comes in part from the nutrient artery of the bone and in part from the surrounding soft parts. An intramedullary nail will injure the nutrient vessels and therefore delay healing. Often one sees a fracture heal quickly when the intramedullary nail is withdrawn.

In a fresh fracture with all necessary tissues present, fixation and contact of the fragments will lead to union. If scar tissue is present between the fragments the bone ends should be excised in order to obtain new growth of the intraosseous connective tissue and an increased blood supply.

The use of grafts is necessary when tissue has been lost or the circulation is impaired. In such cases the combination of complete fixation and transplantation of osteogenetically active bone tissue will provide the optimum conditions for solid bone union.

The reduction often requires only a few seconds. The fixation which holds the fragments together in a functional unit must assure weeks and months of undisturbed healing. The roentgenogram will not show calcification of the callus until long after the fracture is clinically sound. One to two years elapsed in the author's cases before a normally dense shadow was seen.

In the 6 cases described the long tubular bones failed to unite with various methods of treatment, but in each case a satisfactory union was obtained with the Hoffman fixation method. Little callus was formed and joint mobility was preserved. Five of the patients could ambulate with the apparatus and return to light work. No serious infection of the percutaneous screw tracts was noted. —*Robert D. Larsen, M.D.*

Secondary Restoration of Finger Flexion by Digital Tendon Grafts; an Evaluation of 76 Cases. WILLIAM L. WHITE. *Am. J. Surg.*, 1956, 91: 662.

IN THE REPAIR of flexor tendons lacerated between the distal palmar crease and the distal finger joints, failure often is encountered. Secondary repair of these defects, which occur in what is called "no man's land," is best accomplished by the use of free tendon grafts. In the present report, 76 such tendon grafts are evaluated.

The indication for grafting is the inability of the individual to flex adequately the interphalangeal joints after an injury in the danger zone. The author mentions several points in his technique, one of which is to remove the sublimis tendon up to its muscular origin above the wrist. He suggests the use of a palmaris longus graft, or of extensor tendons taken from the second, third, and fourth toes. When the graft is taken, the grafted tendon never should be pulled out; rather, exposure should be generous and the graft should be obtained by sharp dissection throughout its entire length, so that a covering of paratenon will remain on the surface of the tendon removed. When the graft is placed in the finger it should be passed under the ligaments, and if the ligaments have been damaged by injury or infection, or fibrosis, a new pulley mechanism should be formed by passing a piece of small flat tendon around the phalanx. Distally, the author fixes the tendon graft into the insertion of the profundus tendon, either by suture to the tendon stump or by fixation to bone. The author uses the Bunnell pull-out wire suture in this instance. At the upper anastomosis, the use of either silk or a pull-out wire is suggested, and this proximal anastomosis is best done just distal to the origin of the lumbrical muscles.

In analyzing his results, the author denotes them as "excellent" when the finger can be extended fully and the tip can be flexed to within 0.5 inch of the distal palmar crease. "Good," "fair" and "poor" are varying lesser degrees of the first category.

In these 76 cases, 30 lesions were in the right hand and 46 were in the left hand. The index finger was grafted 30 times, the middle finger 14, the ring finger 12, the little finger 11, and the thumb 9 times. The author noted that patients less than 30 and more than 10 years old obtained the best end results. Children less than 5 years old were not considered old enough to co-operate fully to the extent required for such surgery. Women obtained slightly better results from tendon grafting than did men, and the author feels that the better results are due to the fact that women have more supple hands. Those patients with long, thin, pliable hands obtained better results than did patients with rigid, coarse hands, and it seemed that the more intelligent the patient, the better end result he obtained. There also was a relationship between patients' ability to adjust to their disability and the end result they achieved. Psychologic immaturity was associated with a greater proportion of poor results than was a mature attitude toward the disability. Postoperative co-operation was important in ensuring an adequate functional result. Loss of skin coverage was an influencing factor in 10 of the instances, and six of the 10 patients concerned obtained poor results. Loss of skin, therefore, constitutes a major problem in tendon grafting. The type of surgical management of acute injury did not seem significant in the evaluation of the end results, except to show that slightly better results were obtained in the second-stage grafting if no surgical correction of the tendon defect was attempted, but only the skin was repaired. There seemed to be a significant change in the end results when only one tendon was involved, as against the results achieved in multiple-tendon injury. In single-tendon injuries 64 per cent of the patients obtained satisfactory results,

while only 15 per cent of those with multiple-tendon injuries obtained results that could be classed as satisfactory. Associated bone-and-joint injury seemed to detract from the eventual restoration of function, but, generally speaking, injuries to nerves were not significant factors in the eventual result of tendon function. Disturbances in healing associated with induration, frank sepsis, and the like reduced the incidence of good results of tendon grafting, and the number of interval operations also influenced the results unfavorably.

One major factor in the end results was the preoperative condition of the hand. The author divided the condition of hands before operation into the following classifications: "supple," "scarred," "stiff" or "congealed." Among the 28 patients with supple hands, 79 per cent got excellent or good results. Of the 48 who had hands in which scar was a factor, only 35 per cent could be classed as achieving excellent or good end results. Also, if the operative time was longer than 3 hours, or the tourniquet was applied for longer than 2 hours, these excessive time intervals influenced the end result unfavorably. The author noted that considerably better end results were obtained when the palmaris longus tendon was used than when the long extensor tendons of the toes were used. In this series there were 10 infections of wounds, and 5 patients with cellulitis had poor results.

Postoperative immobilization was maintained for 25 days, and the author notes that if the tendon seemed fixed when motion was first attempted, this had a serious effect upon the functional end result. Rehabilitation consisted of allowing the patient to bathe the hand in warm, soapy water several times each day, and this was followed by massage with any bland ointment. Gentle, active motion of the joints was suggested, and the patients were urged to carry out their own program of rehabilitation at home. Gradual improvement subsequently was noted for 6 months or more after this rehabilitation at home, and the author strongly feels that physical therapy is not necessary, since the patient is his own best therapist.

—E. W. Johnson, Jr., M.D.

Certain Rare Anomalies of the Vertebral Column (Au sujet de certaines anomalies rares de la colonne vertébrale). Akif Chakir Chakar and Cevat Alpsoy. *Rev. chir. orthop.*, Par., 1955, 41: 748.

The authors, from Istanbul, Turkey, present before the roentgenologists of France their roentgenologic findings in 6 cases of rare anomalies of the vertebral column, with the request for aid in the interpretation of the films.

The first case is that of a 20 year old girl with a spina bifida of the lumbosacral region, paraplegia, and bilateral club foot. The anteroposterior roentgenogram disclosed an absence of the lamellar arches of several vertebrae, distal to the second lumbar. There was visible the cylindrical, stalk-like shadow of an articulated structure passing from left to right and from above downwards. This apparently supernumerary bone was tentatively designated as "costiform." This osseous fragment terminated in a pseudarthrosis, and was removed surgically for a distance of 6 centimeters.

The second case is that of a female infant of 14 months with spina bifida, block vertebra, and multiple defects. The abnormalities of the associated vertebrae with the clefts are clearly shown on anteroposterior projection. On the left side there are 11 ribs, some of them fused to one another. The lateral view shows an elongated, dense arcuate structure, quite probably corresponding to ribs in an aberrant plane. The eleventh dorsal vertebra is shown to have slipped upon the more distal vertebral column, and here one may suspect a condition of osteochondral dystrophy.

The third case is that of a female infant 18 months of age. There was a spina bifida aperta in the lumbosacral region with flexion of the hip joints and knees, and bilateral clubfeet. On the anteroposterior roentgenogram the first and second lumbar vertebrae appear to be normal; the third and fifth lumbar vertebrae present only the lamellar arches, and the fourth is completely dysplasic. The first dorsal vertebra on anteroposterior view, presents a dorsal defect.

The fourth case is that of a 14 year old boy who presented a lumbar scoliosis with convexity to the left. The twelfth dorsal and the second lumbar vertebrae present the typical "butterfly in flight" appearance on anteroposterior view. The third, fourth, and fifth lumbar vertebrae appear to be fused. There is a bifid sacrum. On the whole, the lumbar vetebrae present the findings of a chondrodystrophy associated with platyspondylitis of the first lumbar vertebra.

The fifth case is that of a male infant of 3 months with a tumor of cystic character protruding from the spinal region and apparently representing a prolongation of the spinal apophysis at approximately the level of the seventh dorsal vertebra. The inferior dorsal spine presents a spina bifida aperta, with a loose bone palpable in the defect.

The sixth case is that of an 18 month old female infant with a spina bifida aperta of the lower dorsal spine with a palpable defect of the posterior portions of the arches and widening and fusion of the lower dorsal vertebral bodies and the body of the first lumbar. On the lateral roentgenogram there is visible an elliptical image with a broad based superior part taking origin from the seventh and eighth vertebral arches, and a lower part arising from the eleventh and twelfth. These two shadows fuse posteriorly in a tail-like structure. The authors tentatively interpret this bizarre shadow as a prolongation of the vertebral lamellar arches assuming a cylindrical form. Upon removal of the tumor it was found to be suspended on its right side from an odd bony protruberance which, it was assumed, originated from the arches of the eleventh and twelfth dorsal vertebrae.

—John W. Brennan, M.D.

The Distribution of the Permanent Paralysis in the Lower Limb in Poliomyelitis; a Clinical and Pathologic Study. W. J. W. Sharrard. *J. Bone Surg.*, 1955, 37-B: 540.

The chief purpose of this study was to determine the distribution of poliomyelitic paralyses in the leg muscles and to relate these to the location of anterior horn cell damage in the lumbosacral spinal cord.

First, the frequency of affection of individual muscles was determined from a series of 142 patients in whom 2,464 muscles were affected. The muscles about the hip (especially quadriceps and hip abduc-

tors) were most frequently involved, but the distal muscles clearly led in the incidence of complete paralysis. A lengthy statistical pairing technique demonstrated the association of paralysis in one group with concurrent paralysis in another group; for example, quadriceps paralysis is strongly associated with paralysis of the hip flexors and adductors, tibialis anterior paralysis with the tibialis posterior muscle. Another analysis of the incidence of muscle involvement related to the cord segment where are located the anterior horn cells innervating the affected muscle, showed a peak of "segmental incidence of muscle affection" in the second and third lumbar segments. On the other hand, similar study of "segmental incidence of (complete) paralysis" showed a broad spread between the fourth lumbar and second sacral segments.

The second part of this study was an attempt to reconcile these observations with the actual locations and distributions of anterior horn cells and poliomyelitic lesions in the spinal cord. Spinal cords from 7 patients who had died after poliomyelitis and in whom the location and magnitude of muscle involvement were known, were studied by the author's method of projection microscopy. The method provides a chart of nerve cell location and concentration in multiple serial sections taken longitudinally. Three normal spinal cords were also studied in this fashion. A comparison could then be made of the presence or absence of cells in the various areas with the known muscle activity in the affected limb. Several important observations were made: some muscles, such as hip flexors, are supplied by long columns of cells while other muscles, such as tibialis anterior, are supplied by short columns; lumbar segments are longer than sacral segments so that a cell column innervating a muscle from a lumbar segment is longer than one innervating a muscle from a sacral segment; poliomyelitic lesions are most frequent and extensive in the second and third lumbar segments; residual power of a muscle was related to the number of remaining motor cells in its supply, but cell destruction was always more severe than had been expected; cell columns responsible for one muscle group in general lie adjacent in the cord to the cell column for another group which is associated with the first in clinical paralysis; the prognosis for a paralyzed muscle is bad if its associated muscles are paralyzed, but good if they are normal or paretic.

Several charts show the location of the cell columns for the leg muscles of normal and diseased specimens. A study of these along with the observations made above indicates that the observed distributions of paralysis can be explained entirely by the pathologic neuroanatomy. Thus the muscles frequently affected but not paralyzed are innervated from long cell cords which are not destroyed, while the muscles frequently paralyzed entirely are innervated from short cell cords. The association of paralysis results from simultaneous damage to adjacent cell cords. The higher incidence of affection of the proximal muscles results from the more frequent location of lesions in the second and third lumbar segments. A patient without real paralysis may have extensive cell damage and should probably be treated by more prolonged rest than has been customary. By relating the clinical paralysis or paresis to the cord area concerned the clinician may be better able to prognosticate and to treat the patient more effectively.

—*Charles T. Ryder, M.D.*

SURGERY OF THE BLOOD AND LYMPH SYSTEMS

BLOOD VESSELS

The Anatomicoclinical Basis for Skepticism Regarding the Operation of Reversal of Blood Flow in the Extremities (Le basi anatomo-cliniche per un giustificato scetticismo verso le operazioni di inversione di circolo negli arti). C. ZAGNONI. *Arch. ital. chir.*, 1955, 80: 191.

THE AUTHOR reviews and discusses the production of an arteriovenous shunt to provide an increased blood flow to an extremity.

On the basis of extensive studies of the valves in the veins of the extremities, as well as clinical and experimental retrograde venography, he believes that this type of operation has little to justify its use and explains purportedly good results on the basis of coincidental factors. —*George L. Nardi, M.D.*

Resection of the Terminal Aorta and Its Substitution By Means of a Homoplastic Aortal Transplant (Resektion der Endaorta und Ersatz durch homoioplastische Aortenverpflanzung). E. S. BRINTNALL. *Langenbecks Arch. u. Deut. Zschr. Chir.*, 1955, 282: 155.

TEN HOMOPLASTIC TRANSPLANTATIONS in the terminal aortic region are reported. These operations were carried out at the University Hospital in Iowa City, Iowa, since 1954. Seven of these interventions were done for aneurysm and 3 for thrombosis. Five were accomplished with homotransplants preserved in Tyrode's solution with the addition of plasma. The remaining 5 were done with aortal specimens preserved in a dry-freezing state.

Through an extensive incision, extending from the xiphoid process to the symphysis pubis, the diseased portion of the aorta was isolated and clamps were placed on the healthy aorta proximal and distal to this area. In no instance was the clamping maintained for longer than an hour. The anastomosis was carried out with everting mattress sutures and completed with over-and-over continuous inverting sutures.

Three of the patients died. One died on the sixth day following the operation. The autopsy gave no explanation. It was assumed that the death was the result of ventricular fibrillation. The second death occurred 4 hours after the operation as the result of the rupture of a small aneurysm which was located 4 cm. proximal to the transplant, and not at the place where the clamp had been applied. The preoperative aortogram had not disclosed the presence of the tiny aneurysm. The third death occurred a week after the operation; the cause of death was an acute hematogenic pyelonephritis.

The elapsed time is still too short for definitive evaluation of the ultimate results; however, the immediate results have been very good in the 7 surviving patients. In one the result was strikingly good. Severe pain and deterioration of the general condition ceased completely after the operation and were replaced by a feeling of perfect well-being.

A detailed discussion of the manner of preserving the aortal transplants used in these cases will appear shortly in the *Journal of the Iowa State Medical Society*. The author gives preference to the dry-freezing method. Transplants so prepared may be preserved practically indefinitely at room temperature. On the author's service there is now sufficient transplant material so that it is possible to dispense with such substitutes as plastic and woven tubes. —*John W. Brennan, M.D.*

Chemical Modification of Arterial Homografts. GILBERT G. EADE, T. LLOYD FLETCHER, RALPH J. SCHLOSSER, RALPH K. ZECH, and HENRY N. HARKINS. *Surgery*, 1956, 39: 515.

SINCE IT IS PROBABLE that chemical modification of arterial homografts may prevent degenerative changes and permit growth of the grafts, experiments were undertaken to evaluate four substances. Ethylene oxide, ethylene carbonate, ethylene amine, and propylene oxide were selected for the studies. Weanling pigs were used because of their rapid growth and suitability for comparison with previous studies.

Segments of thoracic aorta were removed and immersed in the chemical for from 5 minutes to 3 hours. The specimens were then stored at room temperature, or at minus 20 degrees centigrade, either in the chemical itself, in the vapor after decanting the chemical, or in absolute alcohol. After storage, the treated grafts were found to be bacteriologically sterile. The grafts were stored for periods of from 1 to 150 days. As the grafts all became hard and leathery it was necessary to reconstitute them by immersion in saline or water for from 15 to 120 minutes.

Eighty-seven pigs survived implantation of the grafts into the thoracic aorta. Two died of rupture of the graft and 3 died of unrelated causes. The remaining animals were available for study 6 to 8 months after implantation of aorta grafts.

The grafts treated with ethylene amine were all severely calcified and failed to enlarge. Also, the host aorta adjacent to these grafts became calcified.

Grafts treated by the other chemicals, when compared with previous studies using fresh and preserved homografts, showed less tendency to degenerate, as manifested by more growth and less calcification. "The impression gained from this study is that if calcification can be delayed and the elastic fibers preserved for a long enough period the host can more completely replace the homograft and transform it into a visible functional structure." Modification of the graft by various chemicals may effect this delay and further investigations are in progress.

—*Lockert B. Mason, M.D.*

Pectoralis Minor Tenotomy and Anterior Scalenotomy with Special Reference to the Hyperabduction Syndrome and "Effort Thrombosis" of the Subclavian Vein. JERE W. LORD, JR., and PETER W. STONE. *Circulation*, 1956, 13: 537.

NEUROVASCULAR SYMPTOMS secondary to intermittent compression of the subclavian and axillary vessels and the lowermost cord of the brachial plexus are some-

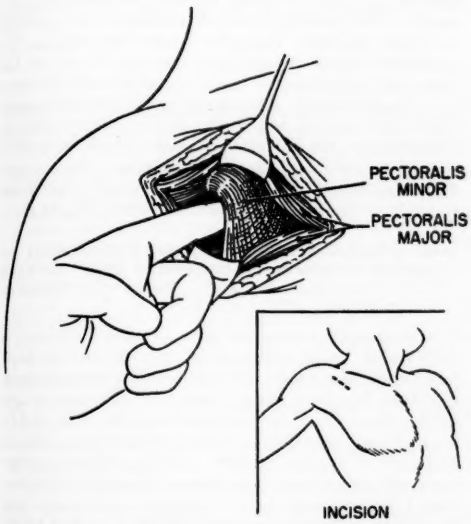

FIG. 1 (Lord, Stone). The pectoralis major muscle has been divided in the direction of its fibers. The operator's finger is behind the tendon of the pectoralis minor muscle. Inset shows approximate position and direction of skin incision for pectoralis minor tenotomy.

times seen following repeated or prolonged hyperabduction of the arms. The primary site of neurovascular compression is thought to be the point at which the vessels and nerves emerge from beneath the pectoralis minor tendon. A secondary site of compression is the interval between the clavicle and the first rib.

Five patients were subjected to pectoralis minor tenotomy and anterior scalenotomy with good results in 4. The good results in the patients with the pure hyperabduction syndrome suggest that the procedure may be valuable in the operative treatment of this particular shoulder girdle syndrome.

—*Ernest D. Bloomenthal, M.D.*

The Collateral Circulation After the Ligation of the Inferior Vena Cava (La circulation collatérale après la ligature de la veine cave inférieure). J. BASTOS, A. S. TAVARES, and C. A. D'AZEVEDO. *Lyon chir.*, 1956, 51: 133.

THE AUTHORS believe that phlebothrombosis of the leg and pelvis is increasing today because of the inadequacy of the medical therapeutic procedures for pulmonary embolism (complication of the lesion).

For this reason many surgeons believe that, in order to prevent this complication, they must interrupt the venous circulation by means of ligation of the femoral veins.

In all cases with small pulmonary infarction (which is the prodrome of future massive embolism), we must ligate the inferior vena cava. The authors ligated the inferior vena cava in 2 patients who had had recent small pulmonary embolism complicating thrombosis of the leg veins. However, on the basis of this small

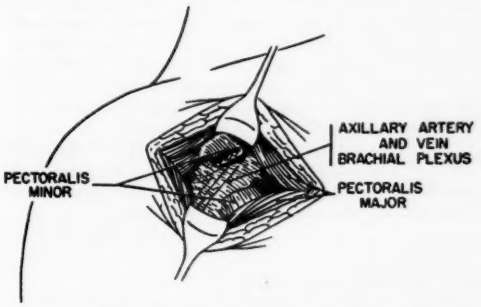

FIG. 2 (Lord, Stone). The tendon of the pectoralis minor muscle has been divided exposing the underlying axillary vessels and the cords of the brachial plexus.

number of cases and a short period of observation the authors do not wish to judge the results. No sequelae were observed in one case and only a slight edema was seen in the other. They believe that the collateral venous circulation is sufficient to prevent complications of vena cava ligation.

CASE 1. M. L. R., 21 years of age, was operated upon on November 25, 1953 for a peptic ulcer (gastrectomy, type Polya). After 5 days he felt some pain in the anterior part of the right chest, but there were no roentgenological signs. Two days later he experienced a sharp chest pain with roentgenographic evidence of a small infarction over the right inferior lobe. After 11 days symptoms of phlebothrombosis appeared in the right leg; 15 days later this thrombosis had extended to the pelvic veins and to the other leg in spite of all therapeutic measures. After operation a slight edema remained in the right leg.

Phlebographic examination on the eleventh, twenty-seventh, and forty-second days after operation revealed perfect collateral development and complete obstruction of the vena cava.

The iliac circumflexes and ascending lumbar veins are very important to the venous circulation.

CASE 2. M. S. A., 33 years of age, was cholecystectomized on December 29, 1953. Eleven days after the operation symptoms of thrombophlebitis of the right tibial region appeared and 2 days after this mammary pain was felt in the lower part of the right breast; hemoptysis was present but the roentgenogram was negative. On the seventeenth day the authors ligated the inferior vena cava under the right utero-ovarian vein; no accident or sequela was observed after operation.

Phlebographic examination performed on the fifth and twenty-fourth days after operation revealed that the collateral circulation was provided mostly by the utero-ovarian and pelvic veins.

The authors believe that their results are almost the same as those of O'Neil and Weinstein in the United States (1947).

The authors have made experimental examinations on dogs. They have seen that collateral veins are developed by intraspinal and perispinal veins and that anastomosis occurs between the lumbar veins

and the venous vessels of the spinal system. They have compared their experimental results with results obtained in their patients and believe that venous supplementary circulation after the ligation of the inferior vena cava is usually provided in three ways: by (1) the abdominal wall veins, (2) the genital veins, and (3) the venous plexus of the spinal cord.

In each kind of obliteration the one system shows more development than the others. This important collateral supply shows why there is no complication after the ligation of the inferior vena cava.

—*M. T. Ghavamian, M.D.*

BLOOD; TRANSFUSION

The Risk of Rapid and Large Citrated Blood Transfusions in Experimental Hemorrhagic Shock. Ake Senning. *Acta chir. scand.*, 1956, 110: 394.

The literature on this subject is briefly reviewed, after which the author reports the results of three experiments (on dogs) designed to re-emphasize the dangers of rapid transfusion with citrated blood.

In the first experiment, 5 dogs were rapidly bled until the blood pressure fell to 30 mm. Hg. Their heparinized blood was reinfused within 5 minutes, with return of the blood pressure to normal levels. Another animal bled in this manner received 75 milliliters of 3.7 per cent sodium citrate solution in the rapidly replaced blood and shortly died of cardiac arrest. A seventh dog, transfused similarly with citrated blood, was saved by the prompt administration of 40 milliliters of 10 per cent calcium gluconate.

In a second experiment on one dog, the superior and inferior vena cavae were connected to a flow meter, blood being returned by pump to the right atrium. The minute volume of the heart dropped much more sharply when citrated blood was transfused after hemorrhage than when heparinized blood was replaced. The blood pressure also returned to normal more rapidly when heparinized blood was used.

In the third study on 3 dogs, prolonged blood clotting times were noted after citrated transfusions following hemorrhage, and the heart action was observed. One dog required cardiac massage to restore good heart action after arrest, despite the intravenous injection of calcium chloride. The intraventricular administration of calcium chloride in another dog corrected the cardiac arrest without massage. In the third dog, cardiac massage restored good heart action without calcium infusion, these ions apparently being mobilized quickly by the tissues.

The author believes, therefore, that heparinized blood is safer than citrated blood for large, rapid transfusions, the excess citrate causing relative hypocalcemia. The "citrate effect" is marked by a rapid fall in blood pressure, impaired blood coagulation, diminished minute volume, and even cardiac arrest. He has noted improvement in the blood pressure of many patients given large amounts of citrated blood during operation immediately upon the administration of calcium ions. His practice is to give 10 milliliters of 10 per cent calcium gluconate or calcium chloride per 450 milliliters of citrated blood whenever rapid transfusion is necessary. —*Emile L. Meine, Jr., M.D.*

Some Clinical and Experimental Observations on Banked Venous and Oxygenated Blood. Donald W. Hannon, John F. Alden, and Ivan D. Baronofsky. *Ann. Surg.*, 1955, 142: 949.

In order to obtain factual data on bank blood as it is used today, experiments were carried out on both human and dog blood. Human citrated banked blood obtained from the Red Cross and ranging in age from one to 25 days was examined for pH, pCO_2, hemoglobin, hematocrit, plasma hemoglobin, oxygen and carbon dioxide content, and for sodium, potassium and calcium concentration. As a control, heparinized blood from healthy young volunteers was studied in the same way. In addition, banked blood 21 to 25 days old was studied in a similar manner, then oxygenated and studied at weekly intervals. Oxygenation was accomplished by gently tilting the blood for 5 to 10 minutes in a 5 quart closed canister containing oxygen under 17 pounds of pressure per square inch.

It was seen that citrated human blood is highly acid and poorly oxygenated regardless of its age. The low pH is due to the mixture of blood with citrate. The low oxygen content of bank blood is due to the low oxygen saturation of blood at its source, the veins of the arm.

Potassium concentration of citrated banked blood is markedly high and rises with storage, whereas citrated human venous blood can be oxygenated and then stored with practically no loss of oxygen for 21 days, and citrated dog arterial blood can be stored with little or no loss of oxygen for 21 days.

The transfusion of citrated fresh blood into 9 dogs subjected to severe blood loss caused in all cases a drop in arterial pH, and cardiac arrest in 4 of the animals.

It is suggested that bank blood as used today has great potential dangers and that an arterial blood bank is not only feasible at this time, but would aid greatly in surgical practice.

—*Stephen A. Zieman, M.D.*

SURGICAL TECHNIQUE

OPERATIVE SURGERY AND TECHNIQUE; POSTOPERATIVE TREATMENT

Emergency Tracheotomy in Closed Injuries of the Chest and in the Pulmonary Complications of Thoracic Surgical Procedures (La trachéotomie d'urgence dans les traumatismes fermés du thorax et dans les complications pulmonaires de la chirurgie thoracique). M. LATARJET and P. DESJACQUES. *Lyon chir.*, 1956, 51: 257.

THE AUTHORS decry the relegation of tracheotomy to the background in France in the past two decades, and attribute the decrease in use of this procedure to the diminishing incidence of whooping cough, tracheobronchitis, and respiratory complications following thyroidectomy. The following case is cited to recall attention to the not infrequent saving of life by emergency tracheotomy.

A physician sustained a fracture of the right femur and crush injury of the anterior thorax with transverse fracture of the sternum in an automobile accident. His past history revealed an artificial right pneumothorax with permanent collapse of the lung. Pain and dyspnea were pronounced, and were even more pronounced the following day. Oxygen was of no avail. The respiratory efforts were extreme and were accompanied by paradoxical movements with constant pulling on the sternal fragments. The lungs were wet from retained secretions. The patient appeared moribund.

Forty-eight hours after the accident the authors saw the patient for the first time and performed a tracheotomy under local anesthesia. Aspirations of mucus and blood were done repeatedly at 5 minute intervals during the first hour, with evacuation of large quantities of material. The improvement was dramatic, and with the abatement of extreme respiratory effort, the sternal fragments became so stabilized that mechanical splintage was deferred. Aspirations were repeated day and night, as necessary, and antibiotics were instituted. The patient's condition improved steadily and the tracheotomy tube was removed on the sixteenth day. He made an uneventful recovery, the sternal fracture healed, and in about 2 months he was entirely well.

The authors cite this case as a dramatic example of the usefulness of tracheotomy in a severe chest injury. Its efficacy is related to a number of factors:

1. Clearing of the tracheobronchial tree, thereby improving respiratory exchange and minimizing the threat of wet lung, consolidation, or bronchopneumonia. Tracheotomy for this purpose is more certain than the passage of a catheter into the trachea without anesthesia, and is less of a strain on the patient than bronchoscopy. Furthermore, it has the advantage that aspirations can readily be repeated as necessary.

2. Reduction of stress in the anxious and excited patient who tends to limit his respiratory efforts.

3. Reduction of the volume of dead space (by about 100 c.c. in the adult) of air in the upper respiratory tract, equivalent in volume becomes functional in the tracheotomized patient.

4. The possibility of introducing oxygen by catheter, under pressure, or in the instance of paralysis, by respirator, as well as the antibiotics, which are used as an adjuvant measure to suppress threatening infection.

The only disadvantage to tracheotomy is the necessity of constant surveillance to insure that the tube is maintained in place and kept patent, and that gauze dressings must be changed whenever they are soiled.

The immediate indication for tracheotomy in closed chest injuries is anoxia (when not due to pneumothorax, mediastinal emphysema, or hemothorax), which is caused by insufficient ventilation due to multiple unilateral or bilateral rib fractures and/or fracture of the sternum. The indication for delayed tracheotomy (1 to 2 days after injury) is bronchial obstruction due to hypersecretions, blood, or pulmonary edema.

After pulmonary operative procedures tracheotomy is useful in: (1) hypoventilation due to excessive pain; (2) bronchial obstruction by blood or pus; and (3) anoxia due to pulmonary collapse. Four illustrative case reports are cited. —*Edwin J. Pulaski, M.D.*

The Treatment of Adrenal Cortical Insufficiency During Surgical Procedures. WILLIAM S. HOWLAND, OLGA SCHWEIZER, C. PAUL BOYAN, and ALMA C. DOTTO. *J. Am. M. Ass.*, 1956, 160: 1271.

PERSISTENT HYPOTENSION during surgery, with failure to respond to adequate blood replacement and vasoconstrictors, respiratory depression, and a prolonged recovery from anesthesia are interpreted as manifestations of adrenal cortical insufficiency. These complications are to be anticipated in patients who have been clinically ill, who have disease involving the adrenals, or who have undergone previous adrenalectomy. Treatment consists in the intravenous administration of hydrocortisone, which steroid acts rapidly.

The authors discuss 7 cases in which this therapy was employed. Patients whose blood pressure had gone too low to measure and whose pulse became impossible to count, responded promptly to hydrocortisone and recovered from the anesthesia without further difficulty. These results suggest that the basic physiologic disturbance was a deficiency of adrenal cortical secretion. —*Ely Elliott Lazarus, M.D.*

A Comparison of Blood Loss and Operative Time in Certain Surgical Procedures Completed with and Without Controlled Hypotension. JOHN W. DITZLER and JAMES E. ECKENHOFF. *Ann. Surg.*, 1956, 143: 289.

A COMPARISON of the amount of blood loss occurring during extensive operations between controlled hypotensive and normotensive patients is reported. The groups were about equal in number and the chief comparisons were made in the group of patients who had radical neck dissections or radical pelvic dissections. Hypotension was induced usually with arfonad, but spinal anesthesia, hexamethonium, and protoveratin A and B also were used. In these patients the

systolic blood pressures were maintained between 60 and 80 mm. Hg. Blood loss was measured by the dry sponge gravimetric technique, and the amount of blood collected by aspiration was added. The loss was found to average 910 milliliters in 29 patients who had radical dissections of the neck utilizing deliberate hypotension, and 1,415 milliliters in 20 control patients. The average operative time was 4′ 45″ with controlled hypotension and 3′ 50″ without it. In 17 patients who had a radical dissection within the pelvis with induced hypotension, the blood loss averaged 1,870 milliliters and in 11 control patients the average loss was 2,805 milliliters. The average operative time was 5 hours with deliberate hypotension and 4′ 35″ in the controls. In both of the series of radical dissections the reduction of blood loss was approximately 35 per cent. Whether or not such reduction is sufficient to justify the hazard involved is a question which cannot be answered definitely, but the authors doubt that an affirmative answer is justified. Perhaps a more significant observation was that made when a similar group of patients operated upon 5 years previously by the same surgeons was compared to the present series. In the group having radical neck dissections there was a greater saving of blood in the 1956 group compared with the 1951 group than in the hypotensive group compared with the 1956 normotensive group. It is of interest that the operative time was not reduced by the use of hypotension. It is pointed out that hypotension carries a considerable added risk of its own and that in the selection of patients for its use, the poor risk patients with complicating cerebral, renal, hepatic, or cardiovascular disease are excluded.—*David T. Petty, M.D.*

Multiple Pulmonary Emboli Following Artificial Hibernation with Hypothermia; Report of a Case. Ronald S. Lambie, Lester G. Joseph, and George Wilson. *Brit. M. J.*, 1956, 1: 840.

A patient with carcinoma of the cardia of the stomach, which was in a hiatal hernia, underwent an esophagogastrectomy in which "artificial hibernation" was used with hypothermia. This 76-year-old man was admitted to the hospital with a history of dysphagia and vomiting of 5 months' duration. He was weak and had had a weight loss of 50 pounds. Barium study demonstrated a hiatus hernia with a possible carcinoma within the hernia. Vital signs were within normal limits, as was the physical examination, except that the liver was palpable two fingerbreadths below the right costal margin; the liver edge was smooth without nodularity. Laboratory studies were within normal limits.

Esophagoscopy revealed a lesion which, on biopsy, proved to be an adenocarcinoma of the stomach. Preparation for surgery included blood transfusions to restore the blood volume, and adequate fluids and electrolytes.

The night before surgery, 100 mgm. of chlorpromazine, 50 mgm. of pethidine, and 3 mgm. of atropine were given intramuscularly. On the morning of surgery the patient was given the "lytic cocktail" of 50 mgm. of diethazine, 10 mgm. of pethidine, and 25 mgm. of chlorpromazine in 250 milliliters of normal saline. Anesthesia was induced by thiopentone sodium, 6 milliliters intravenously, and maintained by 1 liter of oxygen and 2 liters of nitrous oxide. Hypothermia was induced by covering the entire body with small bags of crushed ice. Pulmonary ventilation was assisted by intermittent positive pressure of 12 centimeters of water. One hour after the first "lytic cocktail" had been given it was repeated. The ice bags were removed when the temperature reached 91.4 degrees F., and surgery was started. During the operation 5 mgm. of arfonad was given by intravenous injection, and in 10 minutes the blood pressure dropped to 60/30 mm. Hg. The systolic pressure gradually rose to 100 mm. Hg. The body temperature slowly fell to reach its lowest level at 83.3 degrees F., where it remained for 2.5 hours. Respiratory acidosis was avoided by adequate ventilation. The electrocardiogram did not change throughout the entire procedure, and electrolytes drawn before, during, and after surgery remained within normal limits. The estimated blood loss was 600 milliliters. The operation required 6 hours and the patient was gradually rewarmed over a period of 7 hours.

The postoperative course was uneventful and the patient was walking by the third day. Sutures were removed on the seventh day and the wound was healed. On the evening of the fifteenth postoperative day he suddenly went into shock. He was given noradrenaline to restore his blood pressure, and nikethamide and oxygen; however, his condition rapidly deteriorated and death occurred 36 hours later. At autopsy the pulmonary artery of both lungs was filled with blood clot. The microscopic findings in the lung indicated that pulmonary infarction occurred at some recent time, as well as at the time of death. Speculation as to the cause of infarction includes: (1) the prolonged low systolic blood pressure of 60 mm. Hg., (2) prolonged collapse of the left lung during surgery, and (3) the known rebound phenomena of blood clotting which occurs during the rewarming period. Huguenard warns of this "rebound" and advises the use of heparin during the rewarming period.

A case is presented in which artificial hibernation with hypothermia was utilized to carry an elderly patient through extensive surgery. Death occurred from massive pulmonary embolism. Because of the known rebound phenomenon of blood clotting which occurs during the rewarming period it is suggested that anticoagulants should be used during this period to prevent such a complication.

—*John H. Davis, M.D.*

Acute Postoperative Enterocolitis; Diagnosis and Therapy (Zur Klinik und Therapie der akuten postoperativen Enterocolitis). F. Helmer. *Chirurg*, 1956, 27: 109.

Enterocolitis appeared in 34 patients (23 males) age 8 to 79 years (average 55 years) following surgery of the digestive tract (26), heart and lungs (5), genitourinary system (2), and skull (1).

Clinically two distinct forms of the disease are found:

In one form the temperature rises, often 24 hours before other complaints set in, to be followed by meteorism and paralysis so that peritonitis or paralytic ileus are suspected. Paralysis does not last long. Massive, occasionally bloody, diarrhea appears. There may be gradual or sudden circulatory failure. Leuco-

cytosis, increased nonprotein nitrogen, hypokalemia, hypochloremia, and severe loss of fluid were evidenced. Untreated or insufficiently treated patients succumbed rapidly. The other form, never diagnosed before death, was heralded by a severe state of collapse lasting 24 hours. Only 1 of 7 patients survived for 3 days.

Pathologically, there were pseudomembranous and hemorrhagionecrotising inflammations in various stages of transition in the jejunum, ileum, and colon.

Formerly, therapy was directed against the state of shock. By contrast, in these patients the following measures were instituted.

Fluid was replaced by infusion of aminosol, bioprotin, dextran, or periston with an initial dose of 2 ampules of antistin (maximum 8 ampules per day), together with percorten, 50 mgm., and 5 mgm. of noradrenalin. Antistin was used to combat possible allergens that might have appeared after the use of antibiotics, blood transfusions, or infusions. As a side effect there was paralysis of the gut due to antistin. It responded, however, to usual measures (enemas). Sulfonamides and erythromycin were helpful to combat secondary intestinal infections. Percorten, up to 150 mgm. per day, and noradrenalin, according to the status of the circulation, were given to combat shock. Severe lipoid depletion of the adrenal glands was seen in all untreated cases.

These measures were successful in the treatment of 9 of 34 patients. —*Sidney Smedresman, M.D.*

ANTISEPTIC SURGERY; TREATMENT OF WOUNDS AND INFECTIONS

Traffic Accidents (Ueber Verkehrsunfaelle). G. H. Marcus. *Klin. Med.*, Wien., 1956, 11: 97.

Among 6,610 accidents observed from 1949 to 1954, there were 8,429 injuries, a ratio of 1.3 injuries per accident. Open vehicle passengers were subjected to head injury and the danger of being thrown out of the car. Motorcyclists showed typical transverse injury of the knee, in addition to the hazard of being thrown long distances. Public transportation vehicles may involve many people during an accident and become a strain on hospital organization.

It was again demonstrated that people in the third decade of life are particularly exposed to injury. Pedestrians are in danger from their sixtieth year on. Victims of street accidents treated at the clinic showed a mortality of 1.5 per cent among the young, and 7 per cent in those more than 60 years old. Involvement of the head and face accounted for 36 per cent of all injuries, and the chest, abdomen, pelvis and spinal column showed approximately 10 per cent involvement. Bone and joint injuries including the pelvis, spine, and ribs, amounted to only 25 per cent of all observed injuries.

In general, the cause of death was never explained by one reason alone. In severe skull injuries massive aspiration of the blood can lead to suffocation, a complication which should be considered by personnel giving first aid at the place of the accident. With thoracic injuries severe shock and internal bleeding are common. Thus, one patient sustained a rupture of the aorta. In another there was a rupture of the heart 24 hours after a trolley car collision.

Clinical differentiation between shock and fat embolism was extremely difficult.

Disorientation in the aged was a common complication. Although the mortality rate was higher in the patients more than 60 years old, the therapeutic results in survivors of this age group were the same as in younger patients. —*Sidney Smedresman, M.D.*

Contribution to the General Treatment of Burns (Beitrag zur Allgemeinbehandlung von Verbrennungen). Friedrich-Hans Köpp. *Medizinische*, 1956, p. 127.

The author discusses briefly the pathogenesis of shock after severe burns, especially the mechanism and action of histamine formation by decarboxilation of histidine. Histamine inhibits the breakdown of acetylcholine by cholinesterase, and causes maximal vagotonus, dilatation of the capillaries, and the formation of edema. After severe burns the histamine level of the blood was found to be 1.24 milligrams per liter as compared to a normal of 0.03 milligrams.

To counteract the deleterious effects of histamine shock, the author used a combination of calcium gluconate with an antihistamine, "calcistin." This drug is produced commercially. Calcium reduces the permeability of the capillaries and has a very high "degree of hydration": one calcium ion binds 22 molecules of water as compared with 4 molecules for potassium and 8 for sodium. The mechanism of antihistamines is based on their property of displacing the histamine from its receptors, not of breaking down the histamines.

Calcistin has proved most effective in combating shock, in addition to the usual therapy with transfusions of blood and plasma. It has also a marked analgesic and antipruritic effect. Futhermore, it has been employed successfully in late skin transplantations because it reduces the exudation from the wound and so facilitates the adhesion of the transplantate to the wound surface. It is administered either intramuscularly by the injection of 5 to 10 cubic centimeters twice daily, or by intravenous drop infusion.

The writer used calcistin in 40 cases, some of which are described in detail. He is convinced that in a number of cases the patients would not have survived without calcistin. —*Werner M. Solmitz, M.D.*

The Use of Polyethylene Glycol Ointment in Burns Treated by Exposure. Charles A. MacGregor and Ronald R. Pfister. *Surgery*, 1956, 39: 557.

The ointment used in this study has a water-soluble polyethylene glycol base (carbowax) and contains bacitracin, neomycin, polymyxin, pyruvic acid, methyl and propyl p-hydroxybenzoate. It is applied directly to the burned areas after initiation of systemic therapy and is reapplied as often as is necessary to keep the eschars soft. Débridement is accomplished with minimal trauma at the bedside in most cases. Multiple painful changes of dressings in the operating room are avoided. Wet dressings of 1 to 1,000 zephiran in Ringer's lactate solution aids in further preparation for grafting. Donor sites are also treated with the ointment.

The authors report their experience with 24 burn patients who required grafting. They were impressed

with the low degree of toxicity due to infection. It is their opinion that most of the criteria for an ideal ointment in the treatment of burns is fulfilled by this preparation. —*George R. Holswade, M.D.*

The Surgical Significance of Marjolin's Ulcer; with a Report of 3 Cases. RALPH J. SCHLOSSER, EDMUND A. KANAR, and HENRY N. HARKINS. *Surgery*, 1956, 39: 645.

MARJOLIN'S ULCER is a cancer arising in a burn scar. The cases of 3 patients who have been treated for this disease are presented. The disease is not rate, and all of these patients were seen within a period of 7 months.

The incidence of squamous cell carcinoma occurring in burn scars is given as 2 per cent, and basal cell carcinoma as 0.3 per cent. It occurs more frequently in males than in females. The extremities are involved more commonly than other portions of the body. The age of the burn scar is more important in the development of this lesion than the age of the patient. Many of the patients with burn scars in which cancer developed did not have their burns skin-grafted.

The etiology of this disease is believed to be recurrent chronic irritation of the burn scar. The squamous-cell type of lesion is more likely to arise in deep burns, and the basal cell type in the superficial burn scar.

Squamous-cell carcinoma in a burn scar is more commonly a flat, infiltrative, ulcerated cancer. Less commonly, it may be an everted, vegetative, papillary lesion. Muscle, tendon, or bone may be infiltrated by the ulcer. Lymphatic extension also occurs. Malignant changes may be present at the base of the ulcer as well as at its edges.

Prophylaxis against this disease consists in skin grafting all deep and extensive burns, and in considering all ulcers in burn scars as malignant until proven otherwise. Definitive therapy constitutes radical excision of the ulcer with skin grafting. Regional lymph node dissection may or may not be necessary. At times amputation of an extremity may be required. All treatment must be individualized.

—*Donald C. Geist, M.D.*

A Case of Rabies in Surrey. J. LAUGHLIN and D. J. C. ROSS. *Lancet*, Lond., 1956, 1: 421.

A CASE of rabies, which developed in a man 10 days after his return to this country from Pakistan and about 2 months after the bite (which left no scar) is described. A detailed report is presented, in which a very picturesque description is given of the symptoms, findings, laboratory work, and necropsy studies.

This disease is a rare one, but is so deadly and tragic that it must always be borne in mind when an obscure febrile disease is encountered. The etiologic agent is a neurotropic virus with an incubation period of from 10 days to a year—usually not more than 5 months and commonly from 1 to 3 months. This variation is said to depend on both the situation of the bite and the dose of the virus inoculated. A fresh abrasion licked by a rabid animal can be dangerous, and intact mucosa can transmit rabies.

The virus spreads along the nerves from the site of inoculation; hence bites on the face and hands, areas rich in nerves and usually uncovered, are particularly dangerous. From the spinal cord the virus spreads both distally and to the higher centers and all of the nervous tissue in the body may become infected. Infection is believed to reach the salivary glands along the nerves and not through the blood vessels.

The autopsy findings are those of encephalitis, and the only typical laboratory findings are Negri bodies in the nervous tissue on section and reproduction of the disease in animals by the inoculation of infected tissue.

The established disease falls into three phases:

1. The prodromal state, lasting from 2 to 3 days, with malaise, fever, irritability, loss of appetite, and pain or irritation at the site of the bite.

2. The stage of excitement, lasting from 2 to 3 days, with difficulty in swallowing fluids, alternate rational and irrational periods, severe muscular spasm particularly affecting the muscles of the pharynx and larynx, and an undue susceptibility to stimuli—e.g., noise and draughts. Heaviness on the chest, difficulty in breathing, and hydrophobia are manifestations of the muscular spasm.

3. The paralytic stage, lasting about 24 hours or less, leads to death. The patient commonly remains clear in his mind until near the end.

The paralytic type of disease ("dumb rabies") is rare. There is no excitement and the course is usually longer than that of the "furious" type. The differential diagnosis is from hysteria, tetanus, atropine poisoning, Landry's paralysis, and encephalitis.

In the case reported, as soon as the diagnosis had been reasonably established, the Medical Officer of Health suggested that the patient's wife and child be given a light dose of anti-rabies vaccine, because he believed that there was a slight risk of infection by kissing. Daily injections of 2 to 4 cubic centimeters into the abdominal wall were given for 15 days and no reaction was suffered by either person, and no trouble subsequently ensued.

—*Matthew H. Evoy, M.D.*

Human Bites; a Series Treated with Antibiotics. RALPH O. BUTZ, JR. *Am. J. Surg.*, 1956, 91: 525.

THE AUTHOR reports on a series of human bites treated with antimicrobial drugs at the Hand Clinic of the Department of Surgery at the City of Detroit Receiving Hospital. He also reviews a series of cases reported in the literature, beginning with the classic report of Mason and Koch. It was in this latter report that a plan of treatment for early wounds was established, i.e., soap and water cleansing, conservative débridement, and leaving the wound open to be followed by continuous moist dressings with the hand splinted in the position of function.

At the same time the singular nature of human bite wounds was established. The report of a series of cases by Boyce, in 1948, included the bacteriology of these wounds. The common organisms were Staphylococci aureus and albus, nonhemolytic streptococcus, streptococcus viridans, micro-aerophilic streptococcus, Bacillus proteus and Bacillus subtilis. The emphasis on the fusiform bacillus and spirilla had waned by the time of the present report.

In the author's series there were 44 human bites. The number of human bites seen in the emergency

room is much less than the number of animal bites, but the number of admissions to the hospital of human bite greatly exceed animal bite because of the number of serious infections that occurred. The cases are divided into two groups—one group which was seen on the first day of injury and a second group which was seen the day following injury or later. In the series of 44 patients there were 4 cases of osteomyelitis, all in the late treatment group. To date there are no reports of tetanus in patients with human bite wounds, and the authors believe that tetanus antitoxin should not be given for human bite wounds. All 44 bites were on the hands, except two, which were on the face or ear. Both of the latter two bites were débrided and sutured, and both healed primarily, which suggests a basic difference between bites of the hands and bites of other parts of the body.

In the late cases cultures were obtained and a variety of organisms were present—both Gram-positive and Gram-negative rods and cocci, anaerobic and aerobic. Sensitivity studies performed on these organisms suggested that penicillin, aureomycin, and chloromycetin had a rather satisfactory spectrum but that streptomycin alone would be considered poor.

The recommended treatment is thorough cleansing with soap and water. Inspection of the wound should then be carried out without probing, following which a limited débridement should be performed. No attempt is made to repair lacerated tendons and the wound itself is not sutured primarily. Thorough irrigation with saline is carried out. The hand is rested on a splint and continuous moist saline dressings are applied. The authors use penicillin therapy but they do not use tetanus antitoxin. If the bites are localized any place other than the hand, after thorough cleansing they are sutured primarily. Six case reports are included to exemplify the treatment.

—*Peter Dineen, M.D.*

Current Therapy of Tetanus. HARRY W. HALE, JR., and JOHN F. WEIKSNAR. *Am. J. Surg.*, 1956, 91: 461.

THE AUTHORS discuss the current therapy of tetanus, based on their experience at the University of Buffalo School of Medicine. Although the incidence of tetanus in the United States today is low, still 500 to 600 deaths each year are attributed to that disease. The mortality rate, however, has been reduced from 90 per cent to about 35 per cent. In the past 7 years the authors have treated 5 patients, and after this experience they outlined a management program.

The first step is to establish the diagnosis, which is based usually on clinical history and physical findings. As the syndrome is fairly well defined and unusual, the diagnosis is ordinarily easily established. The history is one of a recent trauma followed by painful rigidity of the muscles of mastication, inability to open the mouth with hyperactive reflexes, soon followed by spasm of the neck muscles, and finally generalized convulsive seizures. The sensorium usually remains clear.

The authors recommend treatment with specific antitoxin after skin testing. The initial dosage is 40,000 units intramuscularly and 40,000 units intravenously. Ten thousand units should also be injected locally about the wound area before any operative manipulation is started. Intramuscular antitoxin should be given in 10,000 to 20,000 unit daily doses for 5 to 7 days thereafter. The wound should be excised or débrided. When there is severe spasm of the muscles about the face, throat and neck, and there is difficulty in clearing respiratory secretions, a tracheostomy is recommended. Often this is carried out at the same time as the wound débridement before generalized convulsions take place. Sedation in fairly large dosage is used (as much as 6 grains of sodium luminal every 4 hours intramuscularly). Paraldehyde and chlorohydrate are also used.

The authors have used muscle relaxants, e.g., curare-in-oil, to help reduce the rigidity, but they feel that this is of questionable value. They do not recommend complete curarization as this requires pressure-controlled respiration. In one case, during the worst stage of convulsions, general anesthesia with sodium pentothal was used with good results. Antimicrobial drugs are used primarily to combat respiratory infection. The utmost in nursing care and observation along with reduction of extraneous stimuli is emphasized. The authors stress the importance of prophylactic antiserum in the unimmunized individual with contaminated wounds.—*Peter Dineen, M.D.*

Heroic Treatment of the Severest Cases of Tetanus (Zur heroischen Therapie schwerster Tetenusfaelle). PIERRE MOLLARET. *Deut. med Wschr.*, 1956, 81: 365.

PATHOPHYSIOLOGIC PROBLEMS and disturbances of the neuromuscular system as well as the narrow limits of symptomatic treatment of tetanus were the subject of a series of lectures held at the Hôpital Claude-Bernard in 1948. A summary of these lectures was published in *Cours Pédiatric Sociale* in 1949. At the same time investigations were carried out, concerning the remarkable changes involving the sympathetic system and the metabolic disturbances resulting from the tetanic spasms and leading to the serious, and in general, to the fatal course of the disease. Further attention was focused on other conditions contributing to death, among them being the involvement of the respiration (increasing or sudden anoxia, respiratory syncopies, spasms of the glottis, aspiration of food rests, atelectases, bronchopneumonic infections), as well as circulatory disturbances, mainly the critical fall in blood pressure, which are more frequently consequences of the respiratory changes than a different entity. On the basis of the results obtained the treatment was gradually improved, but no definite success could be achieved until recently, when chloroform and other anesthetics, such as barbiturates in high doses as well as synthetic muscle relaxants, were discarded. Certainly such measures as barbiturates, synthetic muscle relaxants, and phenodizin derivates have saved many patients in the past and will continue to be successfully employed, but in the most severe cases they are of no real help and their depressing effect, mainly on the respiration, associated with the sedation is contradictory to physiologic treatment.

The therapy developed at Hôpital Claude-Bernard is based on the following considerations:

1. Minimal surgery is required to take care of the circumscript portal of entry as the bacilli are readily destroyable with penicillin.

2. The only existing antidote being physiologic in nature, (the antitoxin of the antitetanic serum) should be administered in massive doses as soon as possible.

3. As the major source of fatalities is represented by the sympathetic, chiefly respiratory, disturbances, appropriate artificial respiration as well as control of the humoral and nutritive metabolism is demanded. H. Lassen at the Blegdamshospitalet in Copenhagen was the first to accomplish these requirements and, later, the author, in the treatment of poliomyelitis. As opposed to Lassen, the author favors mechanical respiration with the Engström apparatus, and does not use anesthesia, which means an additional risk and can be avoided if curarization is maintained over long periods of time. Furthermore, the author emphasizes repeated examinations of the *p*H, and the total carbon dioxide, and oxygen saturation.

4. With the ventilation technique, curarization could be intensified considerably. Maximal curarization appeared to be justified since the side effects of curare, chiefly on the respiration, as described in the English literature, could be disproved experimentally. Animal experiments on this subject have been reported at the Societe de Biologie.

5. Since clonic spasms themselves do not carry major consequences, but initiate the tonic spasms, they have been used as a guide in order to control the level of curarization. This was facilitated by the fact that curare does not inhibit the production of acetylcholin except in the area of neuromuscular transmission, and thus permits the clonic spasms to occur, but it does inhibit the minimal acetylcholin produced during muscular contraction and therefore prevents further contractions.

6. Permanent control of the action of curare is important. One must be able to stop the effect of the drug immediately. Therefore, no depot substances are used, nor is the rectal application, suggested by Schlesinger, employed.

The first patient treated successfully in the manner described was presented at the Académie de Chirurgie in June, 1955. Since then 3 additional cures were obtained. One patient, a 64 year old male, was admitted in poor general condition, exhibiting symptoms of advanced intoxication as well as circulatory failure and respiratory disturbances; the time of onset of the disease was unknown. Although the spasms could be controlled for 5 days, the patient finally died of the pre-existing circulatory failure. Autopsy revealed generalized hemorrhage, mainly involving the gastrointestinal tract, and hypertrophy of the right side of the heart. The 3 patients treated successfully are doing well at the present time. In all of them the treatment in question was begun after conventional measures had proved to be entirely hopeless.

Although the group of patients presented is small, discussion of the treatment seems justified. In addition, it appears that the tendency to use maximal curarization is generally increasing. As opposed to other authors employing maximal curarization together with other measures such as anesthesia, artificial hibernation, radiation, natriumamylobarbiton, and other compounds, the author emphasizes his simple treatment, consisting of (1) maximal curarization until all tonic spasms disappear, the clonic spasms only diminishing, (2) tracheotomy and artificial respiration, and (3) avoidance of anesthesia, only minimal doses of agents supporting the effect of curare being used.

Further investigations pertaining to important patholgic and pharmacologic problems will be reported, but it seems already justified to emphasize the fact that intractable cases of tetanus no longer exist, except for those associated with otherwise incurable complications. The author believes that the term "heroic treatment" will be accepted by all those who have observed hopeless cases of tetanus in the past.

—*Erwin Simandl, M.D.*

Novobiocin; a Limited Bacteriologic and Clinical Study of Its Use in 45 Patients. Roger L. Nichols and Maxwell Finland. *Antibiot. M.*, 1956, 2: 241.

Novobiocin is a new antibiotic derived from a recently discovered species of streptomyces. Rather extensive studies of its properties have previously been made.

The drug was given in an oral capsule containing 250 milligrams and in daily doses of between 1 and 4 grams. It was given for varying lengths of time (an average period of 9.6 days).

Studies were made of 45 patients who had infections which were resistant, either clinically or in vitro, to other antibiotics. Of the 45 patients studied, the majority had staphylococcal, proteus, or Escherichia coli infections.

In staphylococcal infections treated with novobiocin, the results were equivocal because of the frequent necessity for concomitant surgical drainage and the difficulty in assessing the beneficial factor. A few of them appeared to improve more rapidly than they might otherwise have. In several cases the staphylococcus disappeared and was replaced by other organisms. Sensitivity tests indicated the development of novobiocin resistance on the part of some of these staphylococcal organisms.

Previous studies showed some strains of proteus to be inhibited in vitro by small concentrations of novobiocin. This in vitro inhibition was even more marked when the *p*H of the nutrient media was decreased. On that basis proteus urinary infections were treated with novobiocin and at the same time the urine was acidified. The results were rather inconclusive. In a few cases, however, beneficial results were obtained.

Thirteen patients with Escherichia coli infections were treated with novobiocin. In only 3 of the patients was there both clinical and bacteriologic improvement as a result.

In general, there was a gross correlation between the size of the dose and the height of the plasma level of novobiocin. In addition, on a given dosage schedule, the drug did not tend to accumulate but rather reached an early plasma level and remained fairly stable. In 2 patients with urinary disease and nitrogen retention the blood levels reached were of the same order as in patients with normal renal function.

In 4 of the 45 patients studied, a drug rash developed which, in 2 cases, was associated with fever. No gastrointestinal, hepatic, renal, or bone marrow effects were noted.

Studies on the development of resistance during the course of therapy indicated a definite tendency for

resistance to occur when this drug was used alone. The authors considered that combination therapy (with other antimicrobials) might well be the answer and deserved further attention.

—*Arthur M. Simpson, M.D.*

Novobiocin; Further Observations. WILLIAM J. MARTIN, FORDYCE R. HEILMAN, DONALD R. NICHOLS, WILLIAM E. WELLMAN, and JOSEPH E. GERACI. *Antibiot. M.*, 1956, 2: 258.

RECENTLY, the authors presented preliminary observations on novobiocin, formerly referred to as streptonivicin, a new antibiotic that is produced by an actinomycete, Streptomyces niveus. In the present article, the authors discuss the clinical use of the agent, its absorption into the serum, and its excretion after prolonged administration.

In this report on novobiocin, they have tabulated the clinical results obtained in the treatment of 34 patients. The results of these preliminary clinical trials suggest that in novobiocin we have another effective therapeutic agent for the treatment of certain infectious diseases. This agent may prove to be a special boon in the treatment of infections caused by strains of Micrococcus pyogenes that are resistant to other antibiotics. Since there is a glaring need for the effective treatment of Micrococcus pyogenes which is resistant to many antibiotics, it might be wise to consider seriously the restriction of use of this new agent virtually to infectious states caused by such insensitive organisms. It has become clear that the less an antibiotic is used for any reason in a given area, the less there will emerge strains of micrococci resistant to the agent's action. A strain of Micrococcus pyogenes needlessly made resistant to novobiocin in one patient might conceivably provide the basis for lethal cross infection of another patient. Because of the likelihood of ultimately provoking bacterial resistance, one could hardly condone indiscriminate use of the substance, especially in those instances in which sufficient bacteriologic data are not accumulated to indicate a special need for it. The occurrence of allergic dermatitis ostensibly due to the agent also indicates the need for special care in the distribution of novobiocin. An allergic reaction provoked by use of the drug in a minor infection might disallow its use in a potentially lethal infection in the future.

It does not appear likely that the use of novobiocin will be complicated by micrococcal enterocolitis because of the agent's inability to eradicate Escherichia coli, Aerobacter aerogenes, and Pseudomonas aeruginosa. It is effective against some strains of Proteus vulgaris and Streptococcus faecalis. Microscopic examination of the stools of patients receiving novobiocin reveals an almost total absence of gram-positive cocci, but large numbers of gram-negative bacilli, yeasts, and clostridia are present. Cultures of such stools substantiate these findings.

It is apparent that novobiocin is excreted slowly and that antibiotic activity remains in the blood for relatively long periods. Despite this finding, there is no evidence that novobiocin piles up in the serum of patients receiving the agent for a week or more. There is considerable variation in the concentration of novobiocin in the serum following oral administration, not only from patient to patient but in the same patient. A higher concentration of this agent in the serum may indicate a lesser concentration in the feces, and the converse.

Preliminary clinical experience with novobiocin is encouraging. This antibiotic proved highly effective in the treatment of 4 of 5 patients with micrococcal bacteremia; in the fifth patient allergic dermatitis made discontinuation of therapy with the agent necessary. Satisfactory clinical response followed the use of novobiocin in 3 of 4 patients with infections of the skeletal system. The agent was used successfully in 5 cases of micrococcal enterocolitis.

ANESTHESIA

Anticholinergic Drugs in Preanesthetic Medication. C. R. STEPHEN, M. A. BOWERS, W. K. NOWILL, and R. C. MARTIN. *Anesthesiology*, 1956, 17: 303.

TWO ANESTHETIC DEVELOPMENTS in recent times have created problems associated with premedication: (1) the advent of muscle relaxant drugs has permitted satisfactory operating conditions in light planes of anesthesia at levels where the anesthetic drugs themselves do not depress parasympathetic reflexes, and (2) many operative procedures now last for several hours. One approach to this problem is to employ anticholinergic drugs which are maximally effective over longer periods of time. With this latter aim in view, an investigation has been conducted into the feasibility of employing certain synthetic compounds. The effects of atropine, methantheline bromide (banthine), diphenmethanil methylsulfate (prantal) and oxyphenonium bromide (antrenyl) on salivation, cardiac rate, and the electrocardiogram were compared in animals. In an effort to assay the effects of each drug on patients without subjective bias, a "blind study" was conducted.

To evaluate these synthetic compounds further, specific instances of what were believed to be marked parasympathetic reflexes during operation were treated with intravenous injections of these anticholinergic drugs. Antrenyl tended to be more reliable than atropine and productive of less tachycardia than banthine. The anticholinergic effect of antrenyl on the cardiovascular system is marked. The effect is believed to be due to blockade at the level of the autonomic ganglia. It is believed that this compound meets adequately the requirements of preanesthetic anticholinergic medication. Troublesome salivary secretions have been uncommon. The wide variation in response to similar dosages of a drug from one patient to another was one of the interesting observations in this study.

—*Mary Frances Poe, M.D.*

The Place of Chlorpromazine in Anesthesia. SALOMON N. ALBERT, WILLIAM A. SPENCER, MURRAY FINKELSTEIN, and CHARLES S. COAKLEY. *Current Res. Anesth.*, 1956, 35: 101.

THE AUTHORS have investigated certain pharmacological aspects of chlorpromazine that are of interest to anesthesiologists. Studies were conducted on dogs and cats, and clinical studies were carried out on patients. The experiments are summarized.

A reduction of 25 to 50 per cent in systolic and diastolic blood pressures and a rise in pulse rate of 10 to 100 per cent followed intravenous administration. The drop in blood pressure is influenced greatly by the rapidity of the injection. Most sympathomimetic amines have little effect on restoring the blood pressure to the initial control level when administered in therapeutic doses, or even in twice the usual concentration. Depression of the force of contraction of the isolated heart muscle preparation occurred in direct proportion to the concentration of chlorpromazine in the bath fluid, and the drug was found to protect the myocardium against sympathomimetic amines that ordinarily increase the myocardial irritability. In 10 subjects, chlorpromazine did not significantly influence either the rate of cerebral blood flow or the total cerebral metabolism.

It was concluded that chlorpromazine has its place in the protection of the myocardium against ventricular arrhythmias encountered during anesthesia and during hypothermia. It should be administered slowly in dilute solutions and in amounts not exceeding 1.5 mgm./kgm. of body weight. For premedication it will potentiate the action of the depressant anesthetic drugs, will reduce postanesthetic vomiting, and will control psychomotor agitation.

—Mary Frances Poe, M.D.

Intercostal Nerve Block in Upper Abdominal and Chest Surgery. HOWARD A. BENNETT, HARRELL C. DODSON, and BETTY J. BAMFORTH. *Current Res. Anesth.*, 1956, 35: 123.

THE NEED for pain relief in postoperative surgical patients was studied under several circumstances. All of the patients studied had been subjected to abdominal or intrathoracic operations. Most of the abdominal operations were gastric or biliary tract procedures. Narcotic requirements were somewhat greater after gastric surgery than after biliary surgery. Older patients apparently require as much narcotic for pain relief as do younger patients after this type of surgery. A placebo trial reduced narcotic requirements.

The value of intercostal nerve block with a "long acting" local anesthetic substance for relief of incisional pain was investigated. The drug used in over 600 of these blocks was 0.5 per cent nupercaine in almond oil. This preliminary block provides abdominal relaxation which allows the patient to be carried in light anesthesia (first or second plane), and muscle relaxant drugs, when necessary, are needed in very small quantities, and then only during the exploration and/or the closure. The block affords hypalgesia and relief of painful muscle splinting in the affected area for about 48 to 60 hours. There was no reduction in narcotic consumption, nor was the incidence of major pulmonary complications reduced. The authors still believe, however, that the procedure is worth while for the patient's comfort.

—Mary Frances Poe, M.D.

The Unflexed Back and a Low Incidence of Severe Spinal Headache. BERNARD H. ROSSER and MAURICE SCHNEIDER. *Anesthesiology*, 1956, 17: 288.

THE INCIDENCE and the severity of spinal headache seem to vary with the size of the hole made in the dura. The use of small needles has been successful in minimizing this complication. The authors suggest that somewhat larger needles, probably easier to use, may pierce the dura with a relatively small hole if the back of the patient is unflexed. If the dura is stretched by flexion of the back, a rupture may be made in the dura with a hole larger than would result if the needle penetrates the untensed fibers of the dura. To demonstrate this, a small section of dura was removed from a freshly killed dog.

The authors report their experiences with a modification of the technique of giving a spinal anesthetic in the lateral decubitus position, which has resulted in practically eliminating severe spinal headache. The modification consists of *not* flexing the back in the classical nose-to-knee position when the needle is introduced into the dura. Either the midline or the lateral approach to the spinal interspace may be used.

—Mary Frances Poe, M.D.

PHYSICOCHEMICAL METHODS IN SURGERY

ROENTGENOLOGY

Bronchography with Dionosil (Propyliodone); a New Absorbable Bronchographic Medium. JAMES K. V. WILLSON, F. ROBERT PERILLA, and RICHARD B. HANCHETT. *Am. J. Roentg.*, 1956, 75: 720.

FOR MORE THAN 30 YEARS, the generally accepted radiopaque medium for bronchography has been iodized oil, such as lipiodol or iodochlorol. These compounds are capable of giving excellent bronchograms, are not irritating to the bronchi, and are of low toxicity. They do, however, possess the great disadvantage of remaining in the lungs for long periods of time. Usually, the iodized oil is coughed up or removed by phagocytosis, but it may remain in the alveoli for weeks or months and interfere with interpretation of subsequent roentgenograms. This is particularly undesirable in the presence of tuberculosis, and has limited the usefulness of bronchography in this disease, even though it is now generally accepted that active tuberculosis *per se* is not a contraindication to bronchography. Soluble contrast media such as diodrast have been used for bronchography with unsatisfactory results. Dionosil is a new contrast medium which overcomes the major disadvantages of both diodrast solutions and iodized oil. This compound is essentially an insoluble form of diodrast, and therefore it lacks the irritating effect of the soluble compounds, while retaining their low systemic toxicity. Chemically, dionosil is the normal propyl ester of 3–5 diiodo-4-pyridone-N-acetic acid.

In the author's series, 50 consecutive bronchograms were performed on 48 patients at the Johns Hopkins Hospital and at the Baltimore Veterans Administration Hospital. The oily dionosil was used in 24 cases, and the aqueous suspension in 26. There was no selection of cases. There were 14 cases of tuberculosis. Other diseases encountered in this study were bronchiectasis, carcinoma of the trachea and bronchi, congenital cystic disease of the lungs, and chronic pyogenic abscesses. Both of the dionosil preparations were satisfactory when used for the study of these conditions.

The technique employed was identical to that previously used by the authors for iodized oil bronchography. Aqueous dionosil frequently coated the walls of the bronchi but did not usually fill the alveoli. The aqueous suspension is slightly more irritating than the oily suspension. Oily dionosil usually filled the alveoli just as does iodized oil; it was essentially nonirritating. No iodism or other serious reactions were observed. A late reaction of fever 24 to 48 hours after the examination was observed in 8 of 38 patients in whom a follow-up was available. Five were examined with oil dionosil and 3 with aqueous dionosil.

In the series of tuberculous patients, the study produced no detectable influence on the course of the disease. Dionosil is completely cleared from the lungs, usually in 4 days. The material not coughed up is absorbed and excreted by the kidneys. Free iodine is not released. Dionosil is preferable to iodized oil for general use in bronchography. —*Frank L. Hussey, M.D.*

The Current Status of Bronchography with Water-Soluble Media; a Report of 74 Examinations with "Xumbradil Viscous B." ISMAIL NIKNEJAD, J. RICHARDS AURELIUS, DONALD H. PETERSON, and LEO G. RIGLER. *Am. J. Roentg.*, 1956, 75: 701.

THE FIRST REPORT of the successful use of water soluble contrast medium for bronchography was published in 1948. Numerous articles on the use of water-soluble contrast media for bronchography have since appeared in medical literature. Iodized oil enjoyed popularity for three decades but evidence has accumulated to indicate that this medium is responsible for a variety of local and systemic untoward reactions when used for bronchography.

The development of bronchographic water-soluble media has been traced by the authors of this article in a brief historic review. All available new contrast media for bronchography contain two main ingredients, one of which is a water-soluble radiopaque material, the other a substance which is added to increase the viscosity of the former, and thus make it less readily absorbed in the respiratory tract. The contrasting substance used in all of the currently offered media is a water-soluble organic iodide (3, 5-diiodo-4-pyridone-N-acetic acid diethanolamine) or a very close derivative of it such as the one used in dionosil (n-propyl 3:5-diiodo-4-pyridone-N-acetate). The former is a brand of iodopyracet, U.S.P., which has been marketed in this country for a long time as diodrast. The vicosifying ingredient in the compound is a water-soluble cellulose ether, sodium carboxymethylcellulose, or the sodium salt of the glycolic ether of cellulose. In bronchography, the contrast portion of water-soluble media is removed from the lungs within 1 to 4 hours, depending on the viscosity of the medium used. Exception is made for "dionosil," a medium in which the contrast crystals are suspended in water or oil and are removed within 1 to 3 days from the pulmonary bed. The iodine compounds are absorbed from the pulmonary tissues by means of lymphatic venous channels and excreted via the kidneys. Carboxymethylcellulose is a water-soluble substance and is not absorbed by the bronchial epithelium or the pulmonary vascular system. Its elimination from the bronchoalveolar lumen is accomplished by means of peristalsis, ciliary action, cough, and phagocytosis. Delayed pulmonary reaction caused by its presence has not yet been completely determined.

The biologic effects of these media are discussed, and their controversial aspect with regard to the production of granulomatous changes in the lungs is analyzed. The technical aspects of bronchography with water-soluble media are given detailed consideration, and the experiences of various workers with these media are outlined. The method of endotracheal catheterization has been rightly used in this country for bronchography.

Since November, 1951, the authors have been using xumbradil B as the contrast medium for bronchographic examinations at the Ancker Hospital, St. Paul, Minnesota. Seventy four examinations on 64 patients were done in a 2-year period. Diagnostic bronchograms were obtained in most instances, with the exception of cases in which coughing due to inadequate anesthesia prevented satisfactory filling of the bronchial tree. A variety of pulmonary lesions were demonstrated by use of xumbradil viscous B. The most frequent complication has been a slight degree of pyrexia, from 0.2 to 3 degrees F., which occurred in about 59 per cent of the cases. The contrasting substance of the xumbradil viscous B disappears readily from the pulmonary bed usually within one hour. In only one of 32 patients with proven pulmonary tuberculosis was there any increase in the extent of their disease or any clinical evidence of reactivation during a period of follow-up study ranging from 1 month to 27 months following bronchography. All tuberculous patients were receiving chemotherapy before and after bronchography.

The authors conclude that xumbradil viscous B is a safe and satisfactory bronchographic media. Its use is recommended until other media, which are currently being investigated, prove to be superior.

—*Frank L. Hussey, M.D.*

Determining Indications for the Various Procedures of Pulmonary Resection in Tuberculosis with the Aid of Selective Pulmonary Angiography (Die Indikationsstellung zu den verschiedenen Verfahren der Lungenresektion bei der Tuberkulose mit Hilfe der selektiven Lungenangiographie). HH. LÖHR and H. SCHOLTZE. *Fortsch. Roentgenstrahl.*, 1956, 84: 277.

THE EXPERIENCES gained from 70 selective pulmonary angiographic examinations are discussed. The authors attempt to show what may be expected from this method in determining the indications for complete or partial resection of the lung.

The method employs essentially the usual sagittal and frontal exploratory roentgenograms, and sagittal and (when needed) frontal stratigrams. In an effort to evaluate the status of pulmonary ventilation, spirometric and, on occasion, bronchospirometric tests were carried out by means of the method of Knipping-Bolt.

In evaluating the status of arterialization of the pulmonary blood, the authors employ the arterial partial oxygen-pressure tests of Bartels. A partial oxygen pressure of 70 millimeters is regarded as the lowest tension which would permit surgical interventions on the lungs.

The contrast preparation used for the angiographies has been 80 per cent perabrodil (diodrast or iodopyracet); tests are made for possible allergic sensitivity.

The cardiac catheter enters the basilic vein at the elbow and is permitted to glide through the right side of the heart. Under fluoroscopy, it is guided into the right or left pulmonary artery. In order to introduce the catheter into the arterial branch to the right upper pulmonary lobe, the authors recommend placing the patient in a right lateral decubitus position, or employing a mandril to straighten out the cardiac catheter which is normally bent to an angle of 30 degrees. Unless the cardiac catheter is introduced into the artery to the individual pulmonary segment, the entire arterial tree to the lung may be opacified when 12 to 15 cubic centimeters of the high percentage contrast material are injected into the catheter. The shortest possible exposure time is used so that a sharply defined vascular picture is obtained. The electrocardiogram is taken simultaneously and is visible during the fluoroscopic examination.

While the cardiac catheter is in place and while it is being withdrawn the blood pressure is measured in the arterial branch and in the right ventricle and auricle, with the condensator manometer of Hansen and the pressure measuring device of Neuhaus. It is considered advisable to exclude from operation any patients with an increased pressure in the lesser circulation, since it indicates the probable existence of a relative cardiac insufficiency.

There may be added to the local and intravenous anesthesia a brief general narcosis with evipan, nitrous oxide and oxygen. This is especially helpful in nervous children and in adults who have been subjected to lengthy bed rest.

The findings sought during the examination are the morphologic alteration in the profile and course of the pulmonary vessels resulting from such effects as the pull of cirrhotic processes, or of intrapleural or extrapleural pneumothorax, oleothorax, and thoracoplasty. The filling defects following partial resection of the lungs may be observed as well as endangiitic changes in the arteries in the environs of cavities, tuberculomas, caseous foci, and carnification of the pulmonary tissues following long continued compression (irreversible lung collapse).

Particular manifestations to be sought are alterations in the angles of ramification, the lengthening and divergence of the vascular branches, poverty of vascular ramification (the leafless weeping willow sign of Forssman), and abnormally narrowed and distorted vascular lumina. Also to be sought may be the slowing of the blood flow through the vessels as indicated by an abnormally persistent opacification. Normally the shadow cast by the injection of the contrast material lasts but a fraction of a second.

The method may be employed (1) to distinguish between a reversible and an irreversible atelectatic process in those instances in which a resection is planned, (2) to distinguish between a reversible and an irreversible collapse in those instances in which a decortication is planned, (3) to evaluate the extent in intensity of a pulmonary emphysema, and (4), when a partial resection of the lung seems indicated, to determine how extensive it should be.

—*John W. Brennan, M.D.*

Chromate Cancer of the Lungs and Benign Lung Tumors in Chromate Workers (Der Chromatkrebs der Lunge und gutartige Lungentumoren bei Chromatarbeitern). W. HÖFFKEN. *Fortsch. Roentgenstrahl.*, 1956, 84: 151.

FOUR INSTANCES of lung cancer in workers in the chromate industry are reported, together with 2 instances of benign lung tumor under the same circumstances.

The ages of the 4 cancer patients were 52, 54, 55, and 49 years, respectively. The periods of exposure to the fumes and dust of the chromate salts were 18, 19, 19,

and 23 years, respectively. The periods of latency, that is, the periods between the time when contact with the chromate material ceased and that when the cancer appeared, were 5 years in one case and 8 years in another. The periods between the appearance of the initial symptoms and the making of the diagnosis were, respectively, 5 to 6 months, 4 to 8 months, 3 months, and 2 months. In 2 of the instances the condition when diagnosed was inoperable and in 2 it was no longer radically operable.

The benign tumors consisted of intrabronchial fibrolipoma in one case and fibroma of the right lower lobe in another. The respective ages of these 2 patients were 76 and 50 years; the exposition periods were 39 years and 9 years; the latent periods were 17 years and 4 months, the intercalated period was 14 years in the case of fibrolipoma, and the therapeutic measures were respectively endobronchial tumor extirpation and lobectomy.

The early diagnosis of bronchial carcinoma is rendered even more difficult by the frequent association of chronic bronchitis or of pneumokoniosis. The pathological anatomy and histology, the bronchographic and roentgenologic findings, and the clinical course of the pulmonary carcinoma of chromate workers do not essentially differ from those of the ordinary bronchial cancer.

The greatest hope of improving the results obtainable in the treatment of this condition would seem to lie in prophylaxis and in early diagnosis. The author's own experience would indicate that, despite the modernization of production, a marked danger for the lung of the worker still persists in the chromate industry. Perhaps a more complete mechanization will result in the lowering of the incidence of this disease. An earlier diagnosis would seem to lie in the direction of a more frequent control examination of the worker (every 6 months). This should include a clinical study, roentgenologic examination, a check on the erythrocyte sedimentation rate, and a complete blood picture study. Today the IG-Farbenindustrie requires a quantitative estimation of chrome in the urine and in the blood.

Since the 2 cases of benign lung tumor represent only single observations, their relationship to a long-continued inhalation of the chrome dust cannot be affirmed with certainty. However, such a relationship is suggested, since Letterer has shown that the dust produces a diffuse fibrosis in the smaller bronchi and in the alveoli. It may therefore be suggested that a bronchial cancer will develop in the individual worker who has a corresponding disposition; in others only a benign tissue proliferation of local delimitation (fibroma) will occur, and, finally, a diffuse alveolar interstitial fibrosis (pneumokoniosis) may appear in still other individuals. A confirmation of this hypothesis must await further studies on the workers in the chrome industry. —*John W. Brennan, M.D.*

Percutaneous Selective Angiography of the Main Branches of the Aorta; Preliminary Report. PER ODMAN. *Acta radiol.*, Stockh., 1956, 45: 1.

ANGIOGRAPHY of individual branches of the aorta was performed in 20 cases by means of radiopaque polythene catheters inserted into the femoral artery through a percutaneous needle. By heating them, the catheters were bent into a specific shape for each vessel studied. The author illustrates the required shapes. The catheter was maneuvered into the mouth of the proper vessel under fluoroscopic control and roentgenograms were made following the injection of contrast material.

Angiographs taken after catheterization of the innominate artery, the left subclavian artery, and individual renal and celiac arteries are illustrated. Delayed films following injection of the latter vessel revealed visualization of the portal venous system.

The advantage of selective angiography is that it limits the area exposed to the contrast material and requires much smaller amounts, thus reducing toxicity and damage to normal tissues. It also eliminates the visualization of confusing irrelevant vessels.

—*Leslie M. Zatz, M.D.*

Selective Angiography of the Abdominal Aorta with a Guided Catheter. HANS TILLANDER. *Acta radiol.*, Stockh., 1956, 45: 21.

THE AUTHOR used a cardiac type catheter with a specially constructed flexible, jointed, iron tip. This was introduced by surgical exposure into the radial artery and passed into the aorta. It was then guided into place at the orifice of the desired branch of the aorta by a magnet placed under the table and manipulated to direct the iron tip of the catheter in the required direction.

Ten to 15 cubic centimeter doses of 35 per cent umbradil were injected by means of a pressure injecting system, and radiographs were made. The patients received premedication with mild sedatives and intramuscular papaverine, and reportedly experienced little discomfort. The radial artery was saved and sutured at the end of the procedure.

Twenty studies with this method were attempted. In six of seven attempts visualization of a renal artery was successful, and in eight of thirteen attempts the celiac trunk was visualized. In one of the latter the pancreatic circulation was visualized, thus suggesting further possible fields of study. Failures were due to spasm of the brachial artery or an inability to properly direct the catheter to the desired vessel.

—*Leslie M. Zatz, M.D.*

Congenital Anomalies of the Great Vessels of the Mediastinum; a Roentgenologic Study of 7 Personal Cases (Anomalie congenite dei grandi vasi del mediastino; studio radiologico di sette casi personali). FRANCO CHIARIOTTI and CARLO PICCHIO. *Radiol. med.*, Milano, 1956, 42: 321.

SEVEN INSTANCES of congenital vascular anomaly of the great vessels of the mediastinum are reported. None of the patients, except the one with stenosis of the aortic isthmus, complained of symptoms pointing to the heart or great vessels. The diagnosis was made in each of these instances by the simplest of roentgenologic moduses; in fact, the authors are of the opinion that only the manifestation of a grave cardiovascular deficiency will justify recourse to the special technique of angiocardiography. The roentgenologic moduses employed in these 7 personal cases were the simple exploratory, anteroposterior roentgenogram and the barium opacification of the esophagus, associated with

extra films in the two oblique projections, and, in 2 instances, with stratigraphy.

In using the term "congenital" the authors mean that in none of these patients was there a history of specific or nonspecific, acute or chronic, infective processes.

The first case was an instance of the classic "arteria luxoria;" that is, the right subclavian artery arose from the left side of the aortic arch and passed behind the esophagus and trachea. The diagnosis was aided by the fact that the artery arose as a diverticulum which cast a wedge-shaped shadow with its base on the mediastinal shadow and passed visibly toward the right to become the right subclavian artery. Here the esophagus, visualized by means of barium paste, presented in anteroposterior view the form of a capital S with the upper curve with convexity to the right (the vascular diverticulum). This was also seen in the left oblique view with displacement forward of the esophagus as a whole.

The second case was a situs inversus aortae with the convex shadow protrusion appearing to the right of the mediastinal shadow. The shadow of the esophagus presented a convexity to the left and a corresponding one of the right-sided aortic arch on its right border, the whole representing a mirrorlike inversion of the normal. The third and fourth cases presented the same anomaly and essentially the same x-ray findings.

The fifth case was one of double aorta, the right arch being the better developed; this resulted in the impression that the right border of the esophagus was higher placed and deeper than the left border. Further below the esophagus ran vertically and appeared dilated and hypotonic. At the level of the esophageal narrowing the trachea appeared to be pushed anteriorly and was somewhat reduced in caliber.

The sixth case was one of coarctation of the aortic isthmus. The patient suffered attacks of tachycardia and of dyspnea on exertion. Oscillographic readings were reduced in the lower extremities. Here stratigraphy demonstrated strikingly the two bulges, one above and the other below the point of narrowing of the aorta. The shadow of the esophagus showed the two bulges on its left border. On the right oblique projection the upper portion of the aortic arch appeared to be in front of the esophagus, while the lower aortic bulge appeared to be behind the esophagus and was pushing it forward. The findings seemed to verify the reported condition of substenotic dilatation of the descending aorta.

The seventh case was an instance of congenital dilatation of the pulmonary artery. In this case stratigraphy was particularly demonstrative. Even the simple exploratory anteroposterior roentgenogram exhibited an enlarged, dense hilar shadow with polycyclic margins, and a tendency to expansile movements on the right side, while the findings were less marked on the left side, the left hilar region being masked by the cardiac shadow. Directed toward the periphery of the lung from this dense hilar shadow were heavy bands of shadow of the same character, thick and broad at the base and dividing toward the lung borders. This shadow effect was even more pronounced on the stratigraphic film, leaving no doubt as to the vascular nature of the manifestation.

With reference to the etiology, the authors were unable to make a decisive statement. The absence of any pathological causative factor, such as mitral stenosis, Ayerza Arillaga's disease, multiple pulmonary arterial thrombosis, or cardiovascular disease (Roger's disease or Eisenmenger's complex, but no cyanosis) suggests that the condition was a primary congenital dilatation of the pulmonary arteries themselves.

—*John W. Brennan, M.D.*

The Paramediastinal Shadow of the Thymus (Der paramediastinale Schatten des Thymus). L. DÜNNER, *Fortsch. Roentgenstrahl.*, 1956, 84: 18.

THE REVIEWER of the author's book entitled "Klinisch-roentgenologische Differentialdiagnose der Lungenkrankheiten" (Verlag Ferdinand Enke, 1954), wherein the peculiar sail-shaped shadow in the right paramediastinal region of the chest of the nursling was ascribed to the thymus gland, took issue with the author and incidentally ascribed the shadow to the presence of a segmental atelectasis in the region of the right upper lobe. Another reviewer ascribed the shadow to a pleuritis of the superior mediastinum. In their criticisms, these reviewers seemed to depend on the authority of P. Ch. Schmid. In the present article, the author wishes briefly to defend his views from these critical statements.

The author's first defense of his views concerns the possibility of the shadow being caused by a segmental atelectasis. He points out that the lateral border of the shadow—originally the basal margin of the upper right lobe of the lung—moves towards its ultimate position on the shadow image in the direction of the hour hand of a clock moving from 11:45 to 12:00 with the fulcrum at its junction with the mediastinum. The result is a triangular shadow with the base placed proximally. In the paramediastinal shadow here discussed, the base of the triangle is directed distally; if only a segment of the right upper lobe is subtended it is difficult to understand how a shadow such as the sail-shaped image could be produced.

The author was convinced of the correctness of the thymic theory when the work of the English investigators was demonstrated to him as a guest of the roentgenologists of the Childrens Hospital at Hull, England. These results were published in the *Brit. J. Radiol.*, 1948, 21: 252 and the theory has since gained practically universal recognition. Apparently Schmid, when he expressed his views, had no knowledge of this publication.

With regard to the other hypothesis, viz., that the shadow is caused by a mediastinal pleuritis, the thoracic surgeons of today know that in these infants pleural effusion is not encountered.

The author admits that this manifestation of a thymic shadow has not been clearly explained. Just why, in the infant, the thymus should cast such a peculiar roentgenologic shadow and, in particular, why the lower border of the thymus reaches exactly to the level of the interlobar cleft between the right middle and upper lobes, is not known; nevertheless, it would not be logical to conclude, because of the exact correspondence of the thymic shadow with the interlobar cleft, that an atelectasis is present, and it is just as little understood why an atelectasis should act so

differently roentgenologically in the nursling and small child than in the adult. Since the shadow in the nursling turns up as a chance finding without the concurrent presence of pathologic symptoms, there is no reason for assuming that it represents a tuberculous primary complex or that it is an atelectasis which is produced by a mucous plug or by a foreign body.

—John W. Brennan, M.D.

Hyperplasia of the Thymus or Atelectasis of the Upper Lobe? Response to the Remarks of Lasar Dünner "The Paramediastinal Shadow of the Thymus" (Thymushyperplasie oder Oberlappenatelektase? Erwiderung zu den Bemerkungen von Lasar Dünner "Der paramediastinale Schatten des Thymus"). P. Ch. Schmid. *Fortsch. Roentgenstrahl.*, 1956, 84: 20.

The author asserts, with reference to the statement of Dünner, that "it is hard to understand how the behavior of atelectasis in the infant could be so different from that in the adult," that in the infant the bronchial wall is soft and elastic; in the adult it is rigid. In the child the bronchial lumen is narrower and the bronchial lymph nodes swell more readily than in the older person. In the infant the tendency to infectious involvement of the nodes and surrounding structures is greater.

The atelectatic process itself acts differently in the two age groups. In the adult the development is never sudden; the lower border of the upper lobe with its fulcrum at the mediastinum rotates clockwise to become the lateral edge of the shadow, just as described by Dünner; the process of retraction of the lobe is gradual. In the nursling, on the other hand, the process tends to occur suddenly. The upper lobe as a rule, does not retract in the manner as in the adult, but is pulled anteriorly and medially towards the anterior mediastinum and comes to lie between the hilus and the anterior chest wall. To compensate, the lower pulmonary lobe moves from behind into the vacated intrathoracic space. The middle lobe is little affected. The author maintains that this is the manner in which the typical sail-shaped paramediastinal shadows are produced. He supports his statements with clinical, roentgenologic and stratigraphic illustrations.

The author does not question the findings of the English workers (Kenp and others. *Brit. J. radiol.*, 1950, 23: 703) at the Children's Hospital, Hull, England, and he regrets that their publication has only recently become available to him. He agrees that the distinction between the paramediastinal shadow of the thymus and an upper lobe atelectasis is frequently difficult, and that further study is needed. He suggests a table of differential points to assist in making the distinction between the two conditions.

The author maintains that roentgenologically the hyperplastic thymus gland shows no relationship whatever to the interlobar cleft. It is as a rule bilaterally symmetrical, more convex at its border, and does not exhibit as sharply delineated a lower border as does the atelectatic shadow. The thymus is placed retrosternally and parasternally, while the atelectatic shadow (on the laterolateral projection) is separated from the sternum by the middle lobe.

—John W. Brennan, M.D.

Thymus, Atelectasis, or Mediastinal Pleural Effusion? (Thymus, Atelektase oder mediastinaler Pleuraerguss?). C. Esser and F. Hilgert. *Fortsch. Roentgenstrahl.*, 1956, 84: 3.

In the past the peculiar sail-shaped or pennate shadow which is frequently observed in nurslings and small children beside the upper portion of the mediastinal shadow, and protruding into the right lung field, has generally been ascribed to two pathologic conditions: (1) an upper mediastinal pleuritis with an adjacent pleural effusion, and (2) an increased density or atelectasis of the upper lobe, or of one of the pulmonary segments.

The theory of pleural effusion or of localized empyema seems to have been generally abandoned. In the authors' opinion, the chief characteristic which distinguishes the shadow process from that which would be expected from the known behavior of fluid collections lies in the fact that the borders of the shadow, particularly the lower border, continuing laterally in the form of an acuminate process into the delicate shadow line of the interlobar cleft between the upper and middle lobes, usually forms an upper convex border, whereas a fluid collection causes a convexity downward in the direction of the less resistant right lower pulmonary lobe.

This convex lower border is best seen on the stratigraphic film, but the authors warn that the stratigraphic exposure must be made with the patient lying on the right side, since the child will not as a rule control its breathing sufficiently to guarantee against a blurring of the very plane which should be photographed in the immobile state.

The characteristic which chiefly distinguishes this shadow from that produced by an atelectasis of the upper lobe is the sharp delineation of the lateral border. In support of the authors' view that the shadow does not correspond to an atelectasis, they append stratigraphic evidence that the large bronchial passages and the blood vessels of the upper lobe are plainly visible and do not have any intimate relationship with the shadow; and in support of their contention that the shadow does represent a hyperplastic lobe of the thymus gland, they cite the work of Kemp and others (Brit. J. Radiol., 1948, 21: 252) who, by clip-marking the lateral border of the thymus in the cadaver of a child showing this shadow, and then procuring before and after roentgenograms, have shown that the shadow is coextensive with the thymus gland. The work of these investigators has since gained almost universal recognition.

The authors admit that the pathologic processes of atelectasis and of pleural effusion do occur, but they believe that the shadow in its characteristic form represents a hyperplasia of the thymus gland.

—John W. Brennan, M.D.

Basic Combined Cholecystangiography. David J. Mitchell. *Brit. J. Radiol.*, 1956, 29: 133.

Orally administered media like telepaque almost never permit visualization of the hepatic ducts. Only rarely (in about 10 per cent of instances in the literature), and then only by chance, do the oral media permit visualization of the cystic duct or possibly the common bile duct. In order to visualize all three duct

types and the gallbladder, both filled and contracted, the use of biligrafin (cholografin) is necessary. Prior publications concerning the intravenous medium for this purpose have described serial radiographs taken routinely up to as long as 2 hours after the injection of the dye and followed by a fatty meal with further radiographs. Such repeated, intermittent examinations of many patients in one x-ray department is disrupting to the department and inconvenient for the patient. The author has had success with a simpler basic routine.

It has been the author's custom to give 3 grams of telepaque orally after a fat-free supper and 11 hours prior to the examination; no food or drink apart from water is permitted in the interim. A plain radiograph is taken at the outset of the examination. Twenty milliliters of biligrafin are next injected intravenously over a 3-minute period. Thirty minutes are allowed to elapse before taking the second radiograph. A fatty meal, followed by another 30-minute wait, and then the final radiograph completes the basic routine. All films are taken with the patient in the left anterior oblique position, at a 30 to 40 degree tilt.

Among 100 unselected cases the basic routine proved to be entirely sufficient in 95 per cent. In 72 cases the gallbladder filled adequately after the administration of telepaque only. After the administration of biligra fin, 84 gallbladders filled adequately. The cystic duct was visualized in 88 cases, the hepatic ducts in 98 cases, and the common bile duct in 99. A calculus was detected in the cystic duct in 4 cases, in the common bile duct in 4, in a hepatic duct in 1 case, and in Hartman's pouch in 1 case.

If necessary, either the after-injection radiograph or the after-fatty-meal radiograph may be repeated after viewing the initial wet radiographs. Additional biligrafin (20 ml.) may be injected to advantage at any time prior to the fatty meal.

Even further abbreviation of the routine has been successfully conducted by the author without loss of effectiveness. The time after injection has been reduced to 20 minutes and the time after the fatty meal has been reduced to 10 minutes; thus it is possible for the patient to remain on the x-ray table throughout the procedure. —*Everett Shocket, M.D.*

Combined Intravenous Cholecystography and Pyelography. N. H. Aldridge. *Brit. J. Radiol.*, 1956, 29: 127.

For over a quarter of a century pyelography has been regarded as an invaluable method of assessing the morphology and function of the urinary system. A recent introduction, sodium acetrizoate, has been shown by many workers to produce pyelograms of great concentration when used in solutions of 70 per cent concentration.

Cholecystography (a little older than excretion urography) has, in comparison, been regarded as a more successful examination. The original substances used were given intravenously, but subsequent media such as pheniodol (priodax) and telepaque have been used orally. A notable advance came in 1953, with biligrafin, an intravenous medium which demonstrated not only the gallbladder and the main ducts, but the latter alone after cholecystectomy.

On the assumption that the most efficient radiologic examinations of the urinary and biliary tracts require some preparation and intravenous injections, the authors combined the examinations after it was determined, by Mr. N. D. Edge, of the Biological Division of May and Baker, Ltd., that the toxicity of the combined media would not be increased to any great degree.

A series of 50 cases were examined by means of the combined technique, and a method was evolved at this time which was believed to be satisfactory. The conventional preparation includes a low residue diet on the day before the examination, and no food or liquid is taken after the evening meal. A gentle purgative may be taken the previous day. A preliminary fatty meal is given, which usually consists of one-half the standard dose of felevac approximately 1.5 hours before the patient is to be examined. Twenty cubic centimeters of 42.5 per cent diodone and 20 cubic centimeters of 20 per cent biligrafin are used. The two media may be mixed and given in one syringe, or two separate syringes may be employed, using the same needle. A 5-minute pyelogram is taken, compression being used at first, and if it is found satisfactory, 500 cubic centimeters of water are given by mouth. Five minutes later, 25 to 50 milligrams of pethidine hydrochloride are slowly injected intravenously; if given too rapidly, transient dizziness may be produced. Five minutes after this the second pyelogram is exposed, and unless there is reason to prolong this part of the examination the compression is removed and a cystogram is taken. The gallbladder films are then taken with the patient in a prone position and the right side is elevated 30 degrees, using a large cone. The patient is then allowed to leave the x-ray table. If the first film shows the gallbladder to be filling well, two further films are taken 20 minutes later, one in prone position and one in erect position, using a small cone. Unless further views are required the remainder of the felevac fatty meal is given and a final film with the patient in prone position is taken 30 minutes later to demonstrate concentration by the gallbladder. Early films demonstrate the renal pelvis and calyces, and a water diuresis is then induced to reduce the density of the pyelogram; succeeding films show the biliary tract. The method is sufficiently adaptable to accommodate variations from the normal discovered in the course of the examination.

—*Frank L. Hussey, M.D.*

Advantages and Disadvantages of Examination with Biligrafin, Combined with Morphine (Vorzuege und Nachteile der mit Morphiumwirkung kombinierten Biligrafinuntersuchung). A. Boris and P. Lörine. *Fortsch. Roentgenstrahl.*, 1956, 84: 305.

The present report concerns the use of biligrafin in 300 examinations, in 100 of which morphine was combined with the biligrafin. In evaluating the results, the authors make a distinction between cholangiographic examinations (55 cases), examination with biligrafin of patients who have previously had a cholecystectomy, and cholangiocystographic examinations (45 cases), of those with an intact biliary system.

In the cholangiographies (group A) there developed a frank dilatation of the bile ducts in 10 cases, a slight

dilatation in 26; there was none in 13, and there was no excretion of biligrafin in 6. In the cholangiocystographies (group B) there was frank dilatation of the ducts in 5 cases, and of the gallbladder in 19; there was slight dilatation of the ducts in 13 and of the gallbladder in 3; there was no change in the ducts in 18 and no change in the gallbladder in 2; there was no excretion through the ducts in 5 cases nor through the gallbladder in 5 cases. Filling of the gallbladder without visualization of the ducts occurred in 4. There was frank increase of the contrast intensity in 8 cases in group A and in 3 in group B; there was a moderate increase in contrast intensity in 19 in group A and in 11 in group B; there was no change in intensity in 22 cases in group A and none in 22 cases in group B. Severe colicky pains developed after 10 to 180 minutes following the morphine injection in 13 cases in group A and in 3 cases in group B.

In 19 patients who received the combined examination (Group A), and who were later operated upon, the roentgen findings were substantiated in 15; because of technical deficiencies the roentgen findings were not substantiated in 2, while in 2 patients there was no excretion of biligrafin through the liver. The administration of morphine produced a definite improvement in the results of the roentgenologic examination in 9 cases but little improvement in 10.

The author concludes that there is no advantage to be gained by using morphine in the cholangiocystographies. Since the drug tends to induce a spasm of the sphincter of Oddi and to prevent passage of the shadow-casting material into the duodenum, while not interfering with the excretion of the material by the liver, it produces a deeper and longer-lasting shadow. If the gallbladder is functioning, the value of the morphine is nullified by the dilatation of the gallbladder under morphine (up to 2 or 3 times its normal size). The opaque substance fills the distended gallbladder and does not appear in sufficient concentration in the choledochus. In the cholangiographies this disadvantage is not present, and here the test with morphine has proved of most value.

Even in the cholangiographies morphine has its disadvantages. The combination of the biligrafin with morphine, prevents any evaluation of the functional activity of the bile passages. Where such conditions as dyskinesia are suspected their study will require a repetition of the test without the morphine at some subsequent period. A further less serious disadvantage is seen in the greater frequency and severity of the associated manifestations, such as colicky pains, vomiting, nausea, and somnolence.

Despite these disadvantages the authors recommend the routine employment of the combined method in all instances in which the simple biligrafin examination does not show or exclude stones in the bile passages. —*John W. Brennan, M.D.*

RADIUM

The Intensive Divided-Dose Irradiation Therapy of Carcinoma of the Uterine Cervix; Rationale and Late Results. Robert E. Fricke and David G. Decker. *Am. J. Roentg.*, 1956, 75: 502.

The technique of treatment of carcinoma of the uterine cervix in use at the present time at the Mayo Clinic has been described, and results have been tabulated, along with a discussion of the general principles, advantages, and disadvantages of the method. Slight changes in radium technique have evolved from year to year, but the general principles of treatment have not been altered since the commencement of radium therapy at the Clinic in 1915. However, rather marked changes have been made in the technique of roentgen therapy, particularly during recent years. Results obtained in the years 1940 through 1948 inclusive (51.7 per cent of traced patients surviving 5 years) are better than those reported in the past. The 5-year results offer a good indication of "cure" in cancer of the cervix; previous studies have shown that 80 per cent of recurrences occur within the first 2 years, while less than 4 per cent are found after 5 years from completion of therapy of the primary growth. The superior 5-year results in the present study compared with results affecting patients treated in 1915 to 1939, inclusive, are probably due in part to minor improvements in technique, and in part to earlier diagnosis and treatment. The interest of the public in cancer, because of the publicity given this dread disease, has shown patients that cancer is curable in early stages, and has been instrumental in providing the opportunity for earlier diagnosis and treatment.

MISCELLANEOUS

Irradiation Treatment of Tumors of the Rectum, in Their Various Stages, in Collaboration with Surgical Intervention; Critical Review and Personal Contribution (Il trattamento radioterapico del tumore del retto nei vari stadi in collaborazione all'intervento chirurgico; rivista critica e contributo). P. Gambaccini. *Radiol. med.*, Milano, 1956, 42: 251.

Twenty-one rectal cancers were selected from the material of the Radiologic Institute of the University of Florence in Italy. All of the patients had received some form of irradiation treatment and all but 2 had also received some form of surgery.

The author attempts to show that these patients receive benefit from irradiation therapy, alone or in combination with surgery. In this the author differs from a recent worker who asserted that such neoplasms can be cured definitively or for long periods of time if the surgical treatment is early and adequate and that all other forms of treatment are in vain.

A critical evaluation of the operative mortality and the percentage of 5 year survivals following the surgical treatment of rectal cancer appears to be about 6 to 10 per cent and 40 per cent, respectively. Of course, many statistical reports dealing with the particular surgical methods give much higher percentages; however, such figures usually represent series of patients who were especially selected as being appropriate for the technique used.

In the author's series, on the other hand, the postoperative 5 year survivals amounted to 55 per cent, or 15 per cent more than in the general run of patients treated by surgery alone.

This figure does not, of course, give any idea of the clinical amelioration effected in most of the patients, nor does it take cognizance of the number of patients

adjudged no longer operable who not only have procured amelioration, but who, under preoperative irradiation therapy, have become operable.

Incidentally it may be noted that new methods of irradiation therapy have recently been introduced at the Institute, but the results are not yet ready for publication. However, the author already estimates these results at somewhat more than 5 per cent better than those obtained with the normal methods which were used on the material here reported.

With reference to the various normal methods, so-called crossed roentgen irradiation through fixed fields, intracavitary irradiation, contact radium treatment, implantation of needles or seeds bearing radium or radon, and plesioroentgen therapy, the author warns that any standardization of these therapies is to be repudiated as the method used must be adapted to the conditions encountered in the individual case.

Finally, the author concludes that in patients whose condition is frankly operable, radical surgical removal of the neoplastic condition is the method of choice. In patients who are considered hopeless, however, irradiation treatment offers the possibility of reattaining operability. In the patients operated upon postoperative irradiation may afford a means of augmenting the percentage of survivals.

—John W. Brennan, M.D.

Colloidal As_2 $^{76}S_3$; Its Production and Possible Use in the Treatment of Papillomatosis of the Urinary Bladder. GUNNAR WALINDER. *Acta radiol.*, Stockh., 1955, 44: 521.

THE AUTHOR states that multiple superficial tumors of the urinary bladder have been treated with intracavitary radioactive isotopes, the most usual being gamma radiation either from a liquid source or a solid source placed centrally in the bladder.

He points out that in the presence of very superficial papillomas, a beta emitter may not only give a higher dose to the superficial mucous membrane but also would involve less risk of resultant fibrosis of the bladder.

With these thoughts in mind, colloidal Au^{198} has been used; however, since its beta radiation has an average energy of only 0.35 MeV and a half-value-layer in tissue of only 0.4 mm., it is suitable only or extremely superficial tumors.

Radioactive yttrium (Y^{90}) has also been tried, but the author states that it has been difficult to keep therapeutic activities of Y^{90} in a stable solution, and the insertion into the bladder of a noncolloidal solution may involve an increased risk of absorption.

In searching for other radioactive substances which may be of value, the author has tried As^{76} which has a beta radiation with an average energy of 1.17 MeV, a half life of 26.8 hours, and is easily prepared as colloidal As_2S_3.

The author then describes the manner in which the colloidal As_2S_3 was prepared. He prefers casein as the colloid.

The author performed four tracer studies. They revealed that the colloid remained stable during one hour's application, and that no significant absorption of the isotope occurred; however, the author states the *p*H of the urine must be kept between 5 and 8—a more alkaline *p*H will give increased diffusion and a more acid *p*H may cause the protected colloid to precipitate.

The author explains his method of dose rate calculations with an illustrative example.

—William Thorwarth, M.D.

MISCELLANEOUS

CLINICAL ENTITIES—GENERAL PHYSIOLOGICAL CONDITIONS

The Reaction of the Brain, Spinal Cord, and Peripheral Nerves to Talc and Starch Glove Powders. BURTON L. WISE. *Ann. Surg.*, 1955, 142: 967.

TO DETERMINE the reaction of the brain, spinal cord, and peripheral nerves to talc and starch glove powders in experimental animals, 18 adult mongrel dogs were used.

Seventy-five milligrams of powder, an amount somewhat less than could be washed from one pair of rubber gloves as prepared in the operating room, were applied when the cortex or nerve was left intact, and 9 milligrams when subpial reaction or neurorrhaphy was performed.

It was concluded that the starch caused less scarring and cellular reaction than talc, but more than occurred in controls in which no powder was used. Starch was still visible in tissue sections 60 days after operation. Moreover, it was seen that starch glove powder is preferable to talc, but is not entirely innocuous, and should be used as sparingly as possible.

As an accidental finding, intracisternal injection of talc is suggested as a possible method of producing hydrocephalus in experimental animals.

—*Stephen A. Zieman, M.D.*

Multiple Congenital Malformations of the Limbs (Interpretazione eziopatogenetica di malconformazioni multiple congenite degli arti). GIUSEPPE PINOLI. *Minerva gin.*, Tor., 1956, 8: 165.

THE LITERATURE on multiple congenital malformations of the limbs is reviewed and a classification is presented. Various etiological factors are discussed. The theory of human amniogenesis according to Peters and Von Spee, and Rizzatti's hypotheses on aschizamnion as a pathogenic factor in malformations are described.

According to the latter theory the amniotic cavity is formed by an ectodermal dehiscence (splitting open) of a cellular mass. This is referred to as a schizamnion and the defect resulting during the process is known as an aschizamnion.

The case of a newborn infant with multiple malformations of the limbs is described and the cause is ascribed to an aschizamnion.

—*Lucian J. Fronduti, M.D.*

The Pathogenesis and Therapy of the Sudeck Syndrome (Zur Pathogenese und Therapie des Sudeckschen Syndroms). G. EXNER. *Muench. med. Wschr.*, 1956, 98: 257.

THE AUTHOR, of the Orthopedic Department of the University of Marburg, Germany, discusses the pathogenesis and therapy of the Sudeck syndrome. This syndrome is characterized by dystrophy of the extremities caused by a pathologic reaction of the neurovascular system to the traumatic damage, although spontaneous cases without preceding injury have also been observed.

Three stages of the disease are distinguished. The acute stage starts a few days after the injury. The extremity distal from the site of the trauma shows increased heat, redness of the skin, edema, hyperhidrosis, and tenderness. At the same time hypotonia and atrophy of the muscles, especially of the extensors, is observed. Hairs and nails show accelerated growth. Two to 3 weeks after the onset the roentgenogram shows blurred structure and spotty decalcification of the bone. This applies especially to the bones of the hand and foot.

The second stage, starting after 2 to 3 months, shows general dystrophy of all the tissues of the extremity, decreased circulation, deformities of the nails, and a lowered sweat secretion and skin temperature. In the roentgenogram the carpal or tarsal bones show marked decalcification, and the long bones extreme thinning of the corticalis. This stage is reversible and may, under appropriate treatment, end in gradual restoration of function, although the roentgenogram will show demineralization and blurring of the spongiosa even after many months.

The third stage is irreversible. The musculature has virtually disappeared, the bones are atrophic, and often the joints have become ankylotic.

The Sudeck syndrome occurs more frequently in the upper extremity. This observation corresponds to the higher vulnerability of the sympathetic nerve in the cervical area. The initiating stimulus varies widely with the duration and degree of the trauma. It includes mechanical trauma, operation, burn, freezing, thrombophlebitis, and especially infected wounds and tuberculosis of the fasciae and bursae. It seems that a constitutional lability of the sympathetic nervous system, especially hyperthyroidism, is a predisposing factor.

Of particular interest are the spontaneous cases without preceding injury. A number of cases have been observed by the author and other workers in which cervical osteochondrosis and other disease of the cervical spine produced the syndrome. It has also been observed after poliomyelitis, brain tumor, and other diseases of the central nervous system. It is assumed that the sympathetic nervous system plays the role of a catalyst in the pathogenesis of the disease.

The therapy includes immobilization with a cast or splints in the acute stage, for the duration of 2 or 3 months in severe cases. Massage or attempts to mobilize ankylosed joints are contraindicated. Light active exercise in the water bath is beneficial. Extension of an injured extremity by wire or nail traction may act as a trigger mechanism and should be stopped as soon as the first symptoms of the syndrome appear.

To remedy the disturbance of the sympathetic nervous system, temporary sympathetic block is very effective, in the upper extremity by injection of the stellate ganglion, and in the lower extremity by paravertebral block of the lumbar ganglia. Often only a few novocain blocks are sufficient to break the vicious cycle and to effect cure. Intra-arterial oxygen in-

sufflation has also been successful in a number of cases. —*Werner M. Solmitz, M.D.*

Crossarm Bridge Flaps in the Repair of Flexion Contractures of the Fingers. CHARLES R. MCCASH. *Brit. J. Plast. Surg.*, 1956, 9: 25.

THE AUTHOR presents in some detail the indications for the technique described, the advantages of the technique, and a description of illustrative cases. He describes the use of double pedicle bridge flaps of forearm skin to repair (1) extensive or deep scarring of the volar surface of any finger; (2) contractures of long standing with involvement of the flexor tendon, tendon sheath, or digital vessels and nerves which cause bow-stringing of these structures; and (3) scarring associated with destruction of the profundus tendon in which a free tendon graft will later be required.

The advantages claimed for this method include eventual almost complete recovery of tactile sensation; almost self-retentiveness of the flap; excellent blood supply of the bridge; prevention of a tendency of the finger to undergo contracture during healing; stretching of any bowstringed vessels, nerves, or tendons; a good cosmetic result; and rapid completion of all stages of the operation.

The operative technique is carried out in several stages. The first stage consists of freeing the contracture or scar, raising a flap, applying the pedicle to the affected area, and closing the donor site. The remaining stages in adults are carried out under local anesthesia, but in children general anesthetics are used. The remaining stages consist of dividing the pedicles, setting in the flap on the finger, and closing the donor site.

The author advocates finger exercises and a course of prophylactic x-ray therapy as a precaution against keloid formation. —*John J. Bergan, M.D.*

Blood and Urinary 17-Hydroxycorticosteroids in Patients with Severe Burns. DAVID M. HUME, DON H. NELSON, and DONALD W. MILLER. *Ann. Surg.*, 1956, 143: 316.

TWENTY-SIX severely burned men (ages 19 to 47) were studied simultaneously with determinations of plasma and urinary 17-hydroxy-corticosteroids from the fourth to the fiftieth post-burn days. The patients were treated by the exposure method. Fourteen patients received ACTH and/or cortisone during the first 6 days. Most of the wounds were second degree flash burns, but other burning also was involved. The two patients with more than 50 per cent third degree burns died; both had received cortisone and ACTH. Venous samples were used throughout. Samples of urine were not collected beyond the thirty-first day.

The study was divided into groups as follows:

A. Blood corticoids. None of the patients showed subnormal 17-hydroxycorticoid levels at any time (normal: 3 to 28 micrograms per cent)

1. Group not receiving cortisone or ACTH

a. Over 45 per cent burn (5 patients). Ten of 37 values obtained were above the normal range.

b. Less than 45 per cent burn (7 patients). Three of 36 values were above the normal range.

2. Group receiving cortisone and ACTH

a. Over 45 per cent burn (10 patients, including both fatal cases). Twenty eight of 59 determinations were above the normal range. Fatal cases had very high blood corticoid levels.

b. Less than 45 per cent burn (3 patients). Two of 19 determinations were higher than the normal range.

B. Urine 17-hydroxycorticoid levels. Twenty-two of the 25 patients studied demonstrated elevated 24-hr. urinary corticoid excretion on two or more occasions on the fourth to fifteenth post-burn day. (Normal: 4 to 11 mgm. 24 hrs.)

1. Group not receiving cortisone or ACTH

a. Over 45 per cent burn. The patients with a greater amount of third degree burn and more prolonged convalescence tended to show a somewhat greater urinary excretion of corticoids than those with a rapid convalescence. This is just the reverse of the relationships seen in the plasma corticoid levels.

b. Less than 45 per cent burn.

2. Group receiving cortisone and ACTH

a. Severe burns with fatal outcome had very high levels

b. Other burns over 45 per cent; elevated levels

c. Less than 45 per cent; elevated levels. There was suggested evidence that in the group receiving no hormone therapy, the more severely burned patients (complicated cases) tended to have lower blood values and higher urinary excretion than the severely burned patients who recovered rapidly. It was not uncommon to note that plasma levels (free corticosteroids) were high, while urinary corticoid excretion (largely conjugated) was low.

Only 3 of 22 patients studied failed to show at least two blood sodium levels elevated above 147 mEq. Seven of the 9 patients showing marked hypernatremia had elevated blood or urinary corticoid levels during the period of hypernatremia. These determinations were difficult to evaluate because of the hot weather and intravenous administration of saline solution.

In this group of 26 patients studied in the convalescent period from the fourth to the fiftieth day after burning, there was no evidence of adrenal failure in the post-burn period, and no "backswing" of hypoadrenalism. On the contrary, the patients showed increased adrenal cortical activity lasting as long as the sixteenth to seventeenth post-burn day. In some of the patients surgical prodedures were performed, and from this it was concluded that it was possible for the adrenal to respond both to exogenous-administered ACTH, and to trauma in the post-burn period. Blood and urinary corticosteroid determinations were not begun until the fourth day after the burn. By this time corticosteroid levels in patients having major operative procedures have usually returned to normal. By contrast, patients having severe burns may continue to show elevated blood levels into the third week after the burn. In both of the fatal burn cases, extremely high blood corticoid levels persisted up to the time of death.

The criteria for the decisions to treat some patients with cortisone and ACTH while withholding these hormones from others were not included in the report. —*David T. Petty, M.D.*

Starch Powder Granuloma; a Report of 2 Cases. HYMAN SNEIERSON and Z. P. WOO. *Ann. Surg.*, 1955, 142: 1045.

SINCE the first report, in 1933, of a talc granuloma, numerous articles have appeared, corroborating the irritating effect of talcum powder. As a result it has been eliminated from use in most hospitals, and soluble starch dusting powders have been substituted.

Starch powder, while innocuous under ordinary conditions, is still a tissue irritant and should be used with the same precautions as would be taken with any other irritant. Gloves, rubber tubes, and drains must be carefully washed free of gross powder before use in an operation. Care must also be taken to prevent the entrance of clumps of powder from heavily powdered glove surfaces, or when a glove is accidently torn or punctured at the fingertips.

Despite the repeated warning by experimental investigators that starch powders are irritants, there has been practically no report of foreign body reaction sufficient to cause clinical symptoms.

The authors review cases of proven starch powder granuloma following operation, one of which was of sufficient clinical importance to present a serious problem in diagnosis and therapy.

One case was especially significant because of the production of a large tumefaction with signs and symptoms simulating a septic process. Sepsis is a rare finding in talcum powder granuloma. In this case the systemic septic picture was severe, and the patient was prostrated and anemic. This case also emphasizes that symptoms may develop long after the three-week period considered experimentally as a criterion.

In the second case, the patient fell through a bridge causing a tender lump in the right lumbar region. On removal, a microscopic examination of the growth showed the presence of a concomitant starch powder granuloma.

It is concluded that all granulomas should be examined by the starch test and by polarized light in order to diagnose starch powder granuloma.

—*Stephen A. Zieman, M.D.*

Malignant Synovial Tumors (I tumori sinoviali maligni). A. TALLARIGO. *Boll. oncol.*, Rome, 1955, 29: 475.

THE AUTHOR reports 4 cases of synovial malignant tumors which were studied histologically at the Institute of Anatomy and Pathological Histology of the University of Bari in Italy.

The first case was that of a 19 year old female who had been suffering from pains in the left knee. During a fall the left knee had been twisted and thereafter it became rapidly swollen and very painful; it also increased in local warmth. Eventually an arthrotomy was carried out, which disclosed a serosanguineous articular fluid, blood clots, and shreds of tissue. The synovium was diffusely thickened and highly vascularized. A synovectomy was done and a cast applied. Later roentgen therapy was given to the knee and the enlarged inguinal lymph glands on the left side. Four years later the patient was still living but in rather a poor general condition. The process had invaded the upper end of the tibia with the production of a cutaneous fistula at this point, but still without evidence of generalized metastasis.

Histologic examination of the tissue removed from the knee joint disclosed the typical picture of synovioma malignum with extensive deposits of hemosiderin. All about was a heavy layer of connective tissue. Histologic study of the inguinal lymph gland biopsy showed that it was more fusiform and sarcomatous in appearance than the primary neoplasm; it was more loosely woven and contained no deposits of hemosiderin.

The second case was that of a 63 year old male with a tumor involving the region of the right shoulder joint. The mass was the size of a lemon and was located under the right deltoid muscle. There was a history of injury to the right shoulder.

The tumor was removed completely. It exhibited no connection with the shoulder joint; the author considers it to have arisen from a synovial bursa. It was well encapsulated. Again the histologic picture was that of a typical synovioma malignum with frankly sarcomatous tumor cells and a tendency in places to produce an epithelioid type of cell which at times assumed an arrangement about a sort of lumen, suggesting a function of mucoid secretion which is common to all synovial structures. There has been no recurrence.

The third case was that of a 49 year old male who was struck on the right knee immediately above the patella by a fragment of wood. Fifteen days later a tumefaction developed at this point. This swelling grew rapidly in size and pain occurred with movements of the knee joint. The encapsulated tumor was removed. It was firmly adherent to the quadriceps tendon and proximal to the upper border of the superior recess of the articular synovial cavity (at the location of the normal suprapatellar bursa). A month later there was a recurrence, the tumefaction enlarging progressively to form a subcutaneous plaque extending to the middle third of the thigh, but not involving the bone. There was a homolateral adenopathy. The patient is now being given a cycle of roentgen treatments.

Histologically there was the same fibrosarcomatous parenchyma with an admixture of epithelioid agglomerations as previously described. Mitoses were rare.

The fourth case was that of an 18 year old male who developed, without apparent cause, a tumefaction on the volar surface of the upper third of the forearm. Fifteen days after removal the formation recurred at the same place, and 20 days after the second removal it recurred again. A cycle of roentgen treatments was given at this time. The swelling regressed and 2 years after the first removal there was no evidence of either local recurrence or of regional adenopathy.

From his study of this material and of the literature, the author concludes that there is a marked variation in the degree of malignancy of synovioma malignum. It is perhaps true that the tumors which exhibit a component of giant cells of myeloplactic character should be regarded as relatively benign; these tumors he has classified under the group of benign tumors of the synovia; however, in the series here reported the giant cells observed were generally of an atypical character and cannot be considered as contradicting the diagnosis of malignancy. This material demonstrates excellently the peculiarities of this neoplasm of which the relatively benign behavior contrasts so ob-

viously with the malignant character of the histologic findings. —*John W. Brennan, M.D.*

The Problem of Double Carcinomas, Exemplified by Genital and Mammary Carcinomas (Zum Problem der Doppelkarzinome am Beispiel der Genital- und Mammakarzinome). ALFRED SCHUSTER. *Geburtsh. & Frauenh.*, 1956, 16: 160.

THE AUTHOR, of the Gynecological Department of the University of Munich, Germany, attempted to determine whether carcinomas of the mammary gland and of the genital organs occurring in the same patient should be considered as systemic affections. Systemic carcinomas are defined as multiple tumors occurring in the same organ or organ system, either on the basis of some external damaging agent or on the basis of a congenital disposition.

Three different opinions concerning this problem were found in the literature. One group of authors believe that double carcinomas occur more frequently than would be expected from the incidence in the general population. Another group hypothesizes that, on the contrary, the first carcinoma has an "immunizing" influence and prevents the occurrence of another malignancy in the same organ system. Finally, a third group assumes that no etiological connection, one way or the other, exists between the double carcinomas, and that the occurrence of two carcinomas in the same patient is purely accidental.

The author analyzed statistically a series of 2,189 cervical carcinomas subjected to operation and followed up for 5 years. The incidence of breast carcinoma in this series was not significantly higher than that of the general population of the same age groups. The author concluded that the occurrence of genital and mammary carcinoma in the same patient is accidental and no etiological connection can be assumed.

In another project a series of 660 patients with breast carcinoma who had been free of recurrence for 2 years were studied and the incidence of a second carcinoma during the 5 year period following the 2 year interval was registered. Also in this group, the incidence of a second carcinoma of the genital organs was no higher than could be expected on the basis of the vital statistics pertaining to the general population. —*Werner M. Solmitz, M.D.*

EXPERIMENTAL SURGERY

Experimental Reconstruction of the Intrathoracic Trachea; a Preliminary Report of Experimental Reconstruction of the Trachea in Dogs with Fascia Supported by Teflon. STIG EKESTRÖM. *Acta chir. scand.*, 1956, 110: 367.

THE REPAIR of window defects or segmental resection of the trachea may be required after resective procedures for traumatic, tuberculous, or other inflammatory strictures, and after removal of bronchiogenic cysts or tumors of the trachea and bronchi. Window defects have been successfully repaired by fascial, pericardial, or skin grafts, with or without reinforcement. Segmental resection of the trachea or bronchus is preferably repaired by end-to-end anastomosis. When this is impossible, the use of a graft or prosthesis poses a more difficult problem.

In 7 dogs a strip of anterior rectus fascia was wrapped in continuity about a solid plastic rod of teflon, and this tube of tissue was then encased by a teflon sheath resembling the tracheal cartilages. This sheath consisted of incomplete rings connected by a slender bridge. The entire construction was left implanted in the abdominal wall for 3 to 12 weeks, then removed by a second operation. With excess tissue débrided and the center rod removed, the completed prosthesis consisted of a firm but flexible teflon frame incorporated in a connective tissue tube. Each dog then received this graft of autogenous tissue into its own trachea at thoracotomy, without operative mortality. The first 2 dogs became dyspneic after several weeks and were sacrificed. Foreign body reaction was noted about the silk sutures used for these anastomoses, silk having been held responsible by other workers for stricture formation.

In 4 more dogs, stainless steel sutures were used for anastomosis. In 2 of these the grafts were too narrow and increasing dyspnea required their early sacrifice; the other 2 dogs died of illness and an anesthetic accident during bronchoscopy, respectively. The seventh dog remains well 4 months after operation; surgical gut was used for this anastomosis. The author feels that an absorbable suture may be as satisfactory as inert stainless steel wire. Teflon caused no foreign body reaction and infection at the anastomoses was minimal in all of the autopsied dogs. Although the regeneration of tracheal epithelium was incomplete, and was noted in only 2 instances, the author is hopeful that his method may ultimately have clinical application. —*Emile L. Meine, Jr., M.D.*

The Action of Calcium Ascorbate in the Process of Healing of Fractures; Experimental Research (Azione dell'ascorbato di calcio sul processo di guarigione delle fratture; ricerche sperimentali). FRANCESCO CLAUDIO, GUISEPPE CARACCIOLO, and OTTORINO CATANI. *Rass. internaz. clin. ter.*, 1955, 35: 810.

EIGHTEEN MALE RABBITS of medium weight and all fed and conditioned uniformly, were used as experimental animals. In all of them the tibia was exposed operatively and a small portion of it was removed by sawing. The fibula was left intact to act as a splint. The animals were divided into 3 groups: the first group was given general treatment with a calcium ascorbate preparation (Vi-Ci-Sin calcico of the Italian Chemotherapeutic Institute of Milano, Italy); the second was given perifocal injections of this preparation; and the third was left untreated to act as controls.

The group given perifocal treatment did not give satisfactory results, perhaps because the injected amounts were too large, and they are not considered further here.

The animals given general treatment received 0.15 gm. per kilogram daily of the preparation for periods of 7, 15, 20, 25, and 30 days. At the end of each of these periods one rabbit, together with one animal of the control group, was roentgenographed and then sacrificed. The fracture area was removed, and decalcified with 5 per cent nitric acid, and then microscopic cross sections were prepared.

A study of the roentgen films and of the microscopic sections disclosed the fact that the calcium ascorbate

as a general treatment produced an evident influence on the evolution of the callus; in the treated animals the osteogenetic process was accelerated as compared with that in the controls. With the parenteral administration of the calcium ascorbate the preparation arrived at an anion-cation state. It is estimated that general treatment with calcium ascorbate shortened the period of healing of the fracture by at least 15 days.

It remains, of course, to determine definitely the processes set to work by this treatment; however, it is concluded that the ascorbic component exerts an influence on the processes of respiration and oxidation within the injured tissues. The catalyzing action of the ascorbic radical may increase the process of apposition by the callus because of the greater than normal quantity of calcium ions in the blood.

Thus, the authors recommend, in agreement with many other workers, the administration of vitamin-C associated with ionic calcium for the purpose of accelerating the apposition of the salts of calcium in the trabecular network of the osteogenetic tissues in cases of fracture. —*John W. Brennan, M.D.*

Circulatory Studies in Experimental Pulmonary Embolism (Kreislaufuntersuchungen bei experimentellen Lungenembolien). R. PARHOFER, H. KEYSSLER, and FR. SCHEDEL. *Langenbecks Arch. u. Deut. Zschr. Chir.*, 1956, 281: 382.

TO DATE there has been no satisfactory explanation of the releasing factor in embolism. The possibility of reflex processes and circulatory mechanical factors has been suggested. The authors stress the significance of the sensory innervation of the heart in the production of reflex phenomena. Hachmeister dismisses such an explanation and is of the belief that in addition to the size and number of the emboli, it is particularly the number of reserve capillaries available in the lung and the cardiac reserve power that are the determining factors.

The authors of this article conducted experiments on 20 dogs to ascertain whether rutin, which has been demonstrated to have a favorable effect in shock, would have a similar effect in pulmonary embolism. The details of 4 experiments are presented. The embolisms were usually found in the right lower lobe and autopsy revealed a relaxed right heart filled with blood and a contracted, practically empty left heart. It is emphasized that conditions in men cannot be simulated in dogs because the experiments are conducted on healthy animals and because the use of anesthetics will exclude many reflexes.

In common with other workers, the authors found an increased pressure in the pulmonary artery following embolism. The latter could not be attributed exclusively to mechanical exclusion of a portion of the pulmonary tract, and many writers believe that reflex processes are responsible in the form of pulmonary spasm, possibly released from the walls of the vessels through which the embolus passed. The rapid movement of the embolus might have some significance in this regard.

The authors believe that the releasing cause of the rise in pressure in embolism is oxygen deficiency. Autopsy revealed a maximum dilatation of the right heart which suggested failure of the right heart as the cause of death. Embolism may influence the pulmonary circulation in several ways, either because of obstruction of because of reflex processes which produce vascular spasm. The interpolation or opening of arteriovenous short-circuits may play a part as well as hypoxemia which causes dilatation of the pulmonary vessels, or deficient ventilation with a falling oxygen pressure in the alveolar space might lead to constriction of the pulmonary vessels. The authors admit that any definition or limitation of the individual factors would be impossible with their methods. They believe it is important for recovery that the pulmonary tract permits passage of an increased heart-minute volume, which is the prerequisite for the hypoxia reaction.

It is concluded that nonfatal pulmonary embolisms usually result in increased pressure in the greater circulation with a fall in pressure occurring only shortly before death. The pressure in the pulmonary artery rises abruptly following embolism and the arterial oxygen concentration of the blood falls rapidly.

The blood flow through the left coronary artery increases following embolism, and the blood flow through the vena cava and the pulmonary artery is unequal. Pressure in the superior vena cava increases only in the presence of an imperfectly functioning heart. The peripheral blood flow increases following an initial reduction. Rutin preparations were shown to have a favorable effect on embolism symptoms.

—*Edith Schanche Moore*

The Vascularization of Skin Autografts and Homografts; an Experimental Study in Man. JOHN MARQUIS CONVERSE and FELIX T. RAPAPORT. *Ann. Surg.*, 1956, 143: 306.

BY MEANS of stereomicroscopic techniques, direct observation of the vascularization of skin homografts and autografts was made in human volunteers. Such study permitted continuous observation of the minute vessels of the skin and the flow of blood through them. Full thickness grafts were applied to the forearm. Six donor-recipient pairs were cross-homografts and each individual received an additional control autograft. Three other homografts also were studied. Stereomicroscopic examinations were made daily.

There was no observable difference in the vascularization and development of skin autografts and homografts during the first 5 to 7 days (i.e., up to the homograft rejection period). Vessels in the grafts gradually became dilated and filled with static blood during the second 24 hours. By the third or fourth day a sluggish flow of blood was observed, which increased in vigor and became generalized on the fifth or sixth day. (In the autografts at this time, active flow in many vessels of fine caliber appeared and the number of these vessels increased up to the seventh or eighth day and many of the dilated vessels observed during the first days could no longer be seen.) By the tenth day the appearance of the vascular pattern of the autograft approximated that of the surrounding skin. On the sixth day the vessels of the autografts showed active blood flow, proliferation of fine calibered vessels, and gradual disappearance of the dilated vessels seen during the first few days. In the corresponding period, the vessels of the homograft

exhibited progressive dilatation and diminished blood flow, attaining two or three times their original diameter. The flow of blood lessened and ceased by the eighth or ninth day, and in the next 24 hours multiple punctate thrombi were noted along the course of the vessels; rupture of the vessel walls with extravasation of blood followed. The graft landmarks became blurred and escharification and sloughing of the grafts followed.

Apparently the homograft rejection does not begin to occur until after the homografts became vascularized. The changes observed in man were similar to those described in other species studied. The authors emphasize that the homograft rejection phenomenon is an orderly progression of events which leads to eventual escharification and sloughing of the homografts and that the changes selected as criteria for the diagnosis of homograft rejection occur within a time phase defined as the "homograft rejection period."

—David T. Petty, M.D.

The Prevention of Postoperative Adhesions (Ein Beitrag zu den Verhuetungsmassnahmen postoperativer intraabdomineller Verwachsungen). RUDOLF TROMPKE and RENATE SIEGNER. *Langenbecks Arch. u. Deut. Zschr. Chir.*, 1956, 281: 323.

THE AUTHORS performed exploratory celiotomies on dogs to determine the magnitude and time relationship of the development of postoperative adhesions. As early as 3 hours after an operative trauma to the intestinal serosa considerable adhesions occurred; these could be lysed, but this damaged the serosa. If the prevention of adhesions is to be realized, preventive agents must influence the responsible processes within 3 hours.

A predisposition to adhesions in human beings was discussed. The possible higher incidence in asthenic individuals and keloid-formers was noted. Trauma to a surface will cause adhesions, but serous exudates will tend to diminish their incidence and magnitude.

In 14 dogs in which the serosa was scarified on some loops and in others which were just superficially traumatized with a thumb sponge, adhesions occurred, and surprisingly enough, they were more common in the latter group. Although definite vascularization of the adhesions was observed after only 6 days, the adhesions which led to these permanent changes occurred as early as 3 hours after the trauma.

—Karel B. Absolon, M.D.

Hepatic Function in Artificial Hibernation (Funzionalitá epatica nell'ibernazione artificiale). F. MAZZEO and R. CUOCOLO. *Gior. ital. chir.*, 1956, 12: 64.

THE AUTHORS performed research studies on the hepatic function in dogs after they were subjected to artificial hibernation. Sixteen dogs were used. Their temperatures were reduced to 18, 24, 27, and 30 degrees Centigrade, 4 dogs at each level. At the 18 degree level all of the dogs died. On the surviving dogs, numerous tests were performed. These included the Takata-Ara, the Hanger and MacLagan liver tests, the total bilirubin, and the blood protein and fractions; histologic studies were made of the biopsies taken on the first, fifth, and tenth days.

From these studies hepatic insufficiency was found in the animals subjected to 24 degrees of temperature according to the technique of Laborit. In the dogs subjected to temperature reduction to 30 and 27 degrees the tests were all negative.

—Lucian J. Fronduti, M.D.